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RÉSULTATS DES EXPLORATIONS
ZOOLOGIQUES, BOTANIQUES, OCÉANOGRAPHIQUES ET GÉOLOGIQUES
ENTREPRISES AUX
INDES NÉERLANDAISES ORIENTALES en 1899—1900,
à bord du SIBOGA
SOUS LE COMMANDEMENT DE
G. F. TYDEMAN
PUBLIÉS PAR
MAX WEBER
Chef de l'expédition.

Siboga-Expeditie

THE ANTIPATHARIA OF THE SIBOGA EXPEDITION

BY

Dr. A. J. VAN PESCH
Amsterdam

With 8 plates and 262 textfigures

Monographe XVII of:

UITKOMSTEN OP ZOOLOGISCH, BOTANISCH, OCEANOGRAPHISCH EN GEOLOGISCH GEBIED

verzameld in Nederlandsch Oost-Indië 1899—1900

aan boord H. M. Siboga onder commando van
Luitenant ter zee 1e kl. G. F. TYDEMAN

UITGEGEVEN DOOR

Dr. MAX WEBER
Prof. in Amsterdam, Leider der Expeditie

(met medewerking van de Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën)

BOEKHANDEL EN DRUKKERIJ
VOORHEEN
E. J. BRILL
LEIDEN

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SIBOGA-EXPEDITIE.

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PUBLISHERS AND PRINTERS
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CONTENTS.

PREFACE.

Part of the following Report was published at an earlier date, with kind permission of Prof. Dr. MAX WEBER, — viz. the results of the investigation of the subgenus Eucirripathes.

I am very much indebted to my sister Mrs. L. WAP-VAN PESCH for the tiresome work of reading through and correcting my English translation of the manuscript.

January 1914. A. J. VAN PESCH.

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11. 1902. SCHULTZE (L. S.), Die Antipatharien der deutschen Tiefsee-Expedition 1898—1899 (Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia", Bd. II, Lief. 2).
12. 1903. COOPER (C.), Antipatharia (Gardiner Fauna and Geography of the Maldive and Laccadive Archipelagoes. Vol. II, p. 791—796, pt. 65).
13. 1904. ROULE (L.), La place des Antipathaires dans la systématique et la classification des Anthozoaires (Bulletin du Musée Océanographique de Monaco, N°. 16).
14. 1905. ROULE (L.), Description des Antipathaires et Cérianthaires (Résultats d. Camp. Sc. acc. p. Albert I, Pr. Souv. de Monaco).
15. 1905. THOMSON (J. A.), and SIMPSON (J. J.), On the Antipatharia (Report to the Government of Ceylon on the Pearl-Oyster Fisheries of the Gulf of Manaar. Suppl. Rep. 25, p. 93—106).
16. 1905. THOMSON (J. A.), Scotica Collections. Scottish Antarctic Expedition, Report on the Antipatharians (Proc. Physic. Soc. Edinburgh, Vol. 16, p. 76—79).

1) A complete list of literature up to 1889 may be found in 1.

17. **1907**. Roule (L.), Sur la valeur morphologique des épines du polypier des Antipathaires (Paris, C. Rend. Acad. Sc. 1907, p. 1453).

18. **1907**. Thomson (J. A.), Note on a large Antipatharian from the Faeroes (Proc. Royal Phys. Soc. Edinb., Vol. 17).

19. **1907**. Hickson, Alcyonaria, Antipatharia and Madreporaria, collected by the Huxley from the North Side of the Bay of Biscay, August 1906 (Journ. of the Mar. Biol. Ass., Vol. VIII, N°. 1).

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REVIEW OF LITERATURE.

In his Report on the Antipatharia (Challenger, Part LXXX) Brook has given a very comprehensive and extensive critical review of previous literature, and although one could make objections to his opinion in various cases, these objections are not of so fundamental a value as to make it necessary to repeat this critical review. I shall refer to these objections as soon as there is occasion for it in the systematic description of the species. I will not allude to the literature published between the Challenger Report and Roule's "Description des Antipathaires et Cérianthaires", as far as Roule discussed it, but with the same reservation as mentioned above. My review could be limited to the literature published since 1905, if not a publication, indespensable for my systematic considerations, was omitted by Brook, since it was published at the same time as Brook's Report, while Roule does not mention it in his critical review of literature. Roule did not notice that von Koch's research was published before the Challenger Report but still too late to be taken into account to Brook's descriptions of species. — I have in view the publication of G. von Koch: *Die Antipathiden des Golfes von Neapel.* It contains the description of five species, viz. *Antipathes glaberrima* Esper, which Brook had placed in his new genus *Leiopathes* as *Leiopathes glaberrima*; *Antipathes gracilis* n. sp.; *Antipathes subpinnata* Ellis, which Brook mentions in his book under the name of *Antipathella subpinnata* (E. and S.) *non* Gray; *Antipathes larix* Esper = Brook's *Parantipathes larix* (Esper); *Antipathes aenea* n. sp. Together with a detailed description of these species, elucidated by very good figures, von Koch has given a general account of the polyp-structure, histiology, sclerenchyma and some biological details, especially the growth of the colony. In his description of species he also gives anatomical details.

In Roule's review of literature, and in his bibliography, we also miss C. Forster-Cooper, *Antipatharia* published in 1903 in the Fauna and Geography of the Maldive and Laccadive Archipelagoes (vol. II) edited by J. Stanley Gardiner. He describes Antipatharia pertaining to the four genera *Cirripathes*, *Stichopathes*, *Antipathes* and *Aphanipathes*. Forster-Cooper calls attention to the difficulty of making out which properties form a species, since transitions and a considerable variability occur. As the anatomical research was unsuccessful through bad preservation, Forster-Cooper had to found his species on *1* method of growth, *2* colour, *3* size of polyps and their distribution on the corallum, *4* shape of the polyp and its tentacles, *5* size, shape and distribution of spines, and presence or absence of secundary spines; especially the fifth point was taken into account. Forster-Cooper himself says that it is doubtful whether it will ultimately prove a natural classification. — Specimen were found pertaining to the formerly

described species: *Cirripathes? diversa* Brook [1]), *Cirripathes anguina* Dana, *Antipathes spinosa* Carter and *Antipathes pumila* Brook, while as new species appear *Cirripathes gardineri*, which reminds very much of *Cirripathes anguina* Dana; *Stichopathes maldivensis*, *Antipathes chota*, *Antipathes regularis*, *Antipathes rubra*, *Antipathes nilanduensis* and *Aphanipathes plantagenista*, which has many points in common with *Aphanipathes sarathamnoides* Brook. These descriptions, not always given to such an extent as one could wish for, are accompanied by very efficient figures, which can not always make up for the loss of described details. By the genus *Aphanipathes* FORSTER-COOPER is right in remarking that the difference between the two genera *Aphanipathes* and *Antipathes* appears to be founded on very slight grounds.

In 1905 L. ROULE published his researches on the Antipatharia collected by the Prince of Monaco. He begins with a review of literature, published after BROOK's report. After that he treats the morphology, whereby we regret that the preservation of the material is not always efficient, especially of *Stichopathes Richardi* L. R. [2]). Then follow oecology, taxonomy and subdivision, whereby ROULE creates two new subgenera in the genus *Tylopathes*, viz. *Eutylopathes* and *Paratylopathes*. The phylogenetic part, in which the approach of the Antipatharia to the Ceriantharia is advocated next to the primitive and non-secundary structure of the Antipatharia, is followed by the systematic part, wherein, together with the species, the generic determination of which is quite certain, four new species of *Stichopathes* are described, viz. *Stich. flagellum*, *Stich. dissimilis*, *Stich. Richardi* and *Stich. abyssicola*; a new species of *Antipathes*, viz. *A. viminalis* next to *A. aenea* v. Koch; *Antipathella gracilis* Gray; and from the new subgenera: *Paratylopathes atlantica* and *P. Grayi*. A new species of *Leiopathes* is described under the name of *L. Grimaldii*, while *Parantipathes* and *Bathypathes* are each represented by one known species, viz. *Par. larix* Esper and *Bath. patula* Brook. As species, the generic determination of which is not certain, are mentioned by ROULE: *Antipathes? virgata* Esper, *Aphanipathes? squamosa* v. Koch, *Aphanipathes? erinaceus* L. Roule; a new species of *Tylopathes*, appertaining to the new subgenus *Eutylopathes*, viz. *E.? punctata*; *Antipathella? assimilis* Brook. Of course the terminology has to be altered in keeping with SCHULTZE's critical objections to BROOK's systematic views; together with the joining of the genera *Antipathes* and *Tylopathes* the subgenera *Eutylopathes* and *Paratylopathes* disappear, etc. — A description of Ceriantharia is followed by a tabellary review of found species. — Later on I shall refer to several of these species in my systematic descriptions, but in general it is notable that in my opinion the formation of species by ROULE has not always been placed on a proper footing so that various new species ought to be suppressed; I admit that this is possible owing to the very detailed and precise descriptions given by ROULE himself, together with the splendid pictures of colonies and polyps, while often many new species, described by other authors, are left in existence only because the very defective descriptions and the insufficient or wholly

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1) Without explication F.-C. omits the note of interrogation BROOK placed after the generic name of this species; BROOK had only the corallum without the polyps, and the specimen of F.-C. also misses the polyps. It remains therefore undecided whether we have in this case a *Stichopathes* or a *Cirripathes*.

2) ROULE's statement of the species through which he was able to make sections is not clear, as a part of the sentence is left out. The meaning is that sections are made through *A. aenea* v. Koch, *Leiopathes glaberrima* Esper and *Stich. Richardi* L. R., the last of which especially was badly preserved.

lacking figures make it impossible to judge of them positively. We would be wholly content if ROULE's example of detailed and precise description would be followed more generally in a group so rich in transitions and with such a great variability.

In 1905 was also published J. A. THOMSON, "Report on the Antipatharians", the description of the species collected by the Scottish Antarctic Expedition. There were 12 specimen of 3 species, all pertaining to *Bathypathes* Brook. Five specimen belonged to *B. patula* var. *plenispina* Br., one specimen to *B. alternata* Br. and the other six formed a new species, viz. *B. bifida*, whose properties very clearly differ from the formerly described species. The microscopical anatomical research was unsuccessful since the preservation in formol was apparently a bad fixative for these animals; the sections made by THOMSON were useless. — THOMSON complies with the opinion that by *Bathypathes* dimorphism does not occur.

In 1905 THOMSON and SIMPSON published their Suppl. Report on the Antipatharia in HERDMAN's Report on the Pearl Oyster Fisheries of Ceylon. The collection included 13 species, nine of which seemed to be new: *Antipathes gallensis* and *gracilis*; *Stichopathes ceylonensis*, *contorta* and *papillosa*; *Antipathella rugosa*, *elegans*, *irregularis* and *ceylonensis*, while specimen were found from *Antipathes abies* Gray, *Stich. gracilis* Gray (a new variety: *spiralis*) and *Stich. echinulata* Br. Before the systematic description a few general remarks are made, where from it is apparent that the authors have kept in view the great variability of the form and the distribution of the spines, especially in the unbranched colonies, while also the length and the degree of transparency of the tentacles did not seem to them to be a safe criterion, varying as it was with the degree of contraction and the mode of preservation of the polyps. The antlerlike growth of the spines on the base of some species may, according to the authors, be due to a pathological condition. — In *Stich. papillosa* T. and S. a knoblike projection was observed, indicating the remains of a branch. — The various new species, described by THOMSON and SIMPSON, will be dealt with occasionally in my systematic part, for in some cases I had to join some of these to formerly described species. — It is only to be regretted that the figures, especially of the spines, are of too schematical a character as to be of much use, while for an incomprehensible reason the enlargement of the figures is not given, which impairs their value very much, especially since numerical data are not given in the text. — A point of minor importance is that the name of *Antipathes gracilis* cannot be given to T. and S.'s new species, since this name was used by VON KOCH in a prior publication (1889). *Antipathes gracilis* v. K. is not identical with T. and S.'s species, and F. COOPER (1909) has called it: *Antipathes herdmani* n. sp. (which ought to be "(T. and S.) n. n."). THOMSON and SIMPSON remark that this species most closely approaches to *Antipathes spinosa* (Carter) but differs from it both in the mode of branching and in the character of the spines. But on comparing BROOK's description with that of T. and S.'s colony the difference is not very great and may be considered as remaining within the limits of the individual variability, for the mode of branching as well as for the shape of the spines; so it will be better to identify T. and S.'s colony with *Antipathes spinosa* (Carter) but in view of the polyps described by THOMSON and SIMPSON for the first time, this species should be included in the genus *Parantipathes*, as *Par: spinosa* (Carter) n. n.; the shape of the colony is in accordance with this view. So the new name, given by COOPER, had to be suppressed.

In 1907 L. ROULE published a short remark: "Sur la valeur morphologique des épines du polypier des Antipathaires" (C. R. Acad. Sc. Paris 1907). The Charcot Expedition had found in the Antarctic a Gorgonida (*Rhopalonella* n. g.) which had Antipatharian spines. On the lower part of the axis these spines were short and massive, just like the spines of the Antipatharia, but on the higher parts of the colony these spines were more numerous and longer the higher they were situated on the axis, so that they gradually changed into the very thin polyp-bearing branches, which were fixed with a broadened base on the stem. ROULE compares these spines with those of the Antipatharia, which clearly may also occur in the other Anthozoa. ROULE considers them as "branches abortives". The unbranched colonies of the Antipatharia have only these ones; the branched colonies add to them the normal branches.

Also in 1907 J. A. THOMSON described a large specimen from the Faeroes, "remarkable in being an Antipatharian, for the occurrence of a representative of this order in northern waters near Britain was, to say the least, unexpected; and in the second place because of its huge size (over a yard in height)". Polyps are unknown. The corallum, according to THOMSON, is very much like *Parantipathes larix* Esper but also reminds very much of *Taxipathes recta* Brook. Numerous filiform pinnules, arranged in six vertical rows, give the branches the appearance of a bottle-brush. "For these reasons this specimen is", in my opinion rightly, "referred to *Par. larix* Esper, involving a slight modification of the diagnosis of this species, as well as a great extension of its previously recorded range of distribution".

In the same year (1907) HICKSON published the description of the Antipatharia, collected by the "Huxley" from the North side of the Bay of Biscay in August 1906. — Together with specimen of *Parantipathes larix* Esper and one specimen of *Schizopathes crassa* Brook HICKSON describes six specimen as *Stichopathes spiralis* Pourt., pertaining to the species named by BROOK *Stichopathes pourtalesi* and named by POURTALÈS himself *Antipathes spiralis*. The Schizopathes-species only is described to a certain extent but the other species are only mentioned with locality and depth. — More detailed descriptions are not published, even at a later date.

In 1909 C. FORSTER-COOPER published *Antipatharia* collected by the Percy Sladen Trust Expedition to the Indian Ocean in 1905. The author gives a few preliminary remarks on the specific characters of the Antipatharia. The method of growth of the colony gives him the opportunity of relevating the uncertainty of species-making when only a single specimen is found. In his opinion Dr. JONES' researches on the external influence on the growth of corals, producing various types of growth from a single specimen, support the view that similar causes are producing similar results in the Antipatharia. "Caution must be exercised in using as an index of specific rank slight differences in the shape of colonies, which otherwise do not greatly differ from one another". Also in the use of the spines as specific characters one ought to be very cautious in view of the great variability on one and the same colony. — A short introduction is given to the genus *Stichopathes* Br., but these remarks for the greater part also hold good for the other genera, especially as to the spines. Described are: *Stichopathes echinulata* Br., *papillosa* T. and S. var., *longispina* n. sp., *alcocki* n. sp., *regularis* n. sp., *seychellensis* n. sp., *lütkeni* Br. (the polyps are absent in this species, so that it remains a dubious species!), *bournei* n. sp., *Cirr. anguina* Dana, *Schiz. affinis* Br., *Bath. patula* Br. with typical

details on the development of the ova, which apparently are liberated by the rupture of the polypwalls while the colony to all probability dies; *Aphanipathes*? *somervillei* n. sp., *hancocki* n. sp., *Antipathes*? *heterorhodzos* n. sp., which in my opinion is not an *Euantipathes* but an *Eubathypathes*, nearly related to my *Eubathypathes quadribrachiata* but whose polyps are lacking so that this question is not to be decided, although not only the mode of branching but also the character of the spines, which are rather typical in the subgenus *Eubathypathes*, are in favour of my opinion; *Ant. abies* (Linn.) Gray var. *paniculata* Esper, *Ant. gracilis* Gray (*non* v. K. and T. and S.), *Ant. herdmani*, which is no sp. n. but a new name for THOMSON and SIMPSON's *Ant. gracilis*, which is discussed by me, in the review of the publication of these authors; *Ant. virgata* Esper, *sealarki* n. sp., *plana* n. sp., *ceylonensis* T. and S., *myriophylla*? Pallas, *irregularis* n. sp. — Although the colonies and especially the spines are figured in a very clear manner, it is to be regretted that, especially in the *Stichopathes*-species, the polyps are not figured (exc. *Stich. seychellensis*) while the description is rather short and lacking of details in this respect. The other genera are somewhat better provided but the description is very cursory on the whole. While the enlargement of the figures on the plate is given, it is omitted in the pictures in the text, which is to be regretted, especially with regard to the spines. I will revert to several of these species in my systematic part.

E. SILBERFELD published in 1909 "Japanische Antipatharien" in the "Beiträge zur Naturgeschichte Ostasiens". SILBERFELD has taken the trouble to make a summary of genera and species, without making a critical review which would have greatly increased its value, since such a critical review until now is lacking and the forming of new species proceeds unimpeded. However, SILBERFELD's list would have been very useful if not serious omissions occurred in the enumeration of the species and even of the genera. *Antipathes glaberrima* Esper, described by VON KOCH, is omitted, *Stichopathes gracilis* var. *α* SCHULTZE is missing; *Aphanipathes Wollastoni* (Gray) Brook and its variety *pilosa* Johnson do not belong to the species dubiae, where SILBERFELD has put them down, for both the polyps were found and described. — The genus *Arachnopathes* is wholly lacking with all the species appertaining to it, and these are not found back in one of the other genera (e. g. *Antipathes*).

The species-description is preceded by a short discussion of the points that come under consideration for the discrimination of species. SILBERFELD regards the properties of the axis and the spines as the most weighty points. Under the Indivisae are described the already known species *Stichopathes filiformis* (Gray) Brook and *Cirripathes spiralis* (Linn.) Blainv., while as new species are added: *Stichopathes spinosa*, *Stich. japonica* and *Cirripathes densiflora*. In the little group of Crustosae a new genus *Tropidopathes* is formed with the only species *Trop. saliciformis*, found in one specimen, covering the branches of a colony of hydroidpolyps and armed with very broad spines, confluent on one side of the axis. — Under the Ramosae are described as known species *Antipathes bifaria* Brook, *Ant. japonica* Brook, *Aphanipathes abietina* Pourt., *Parantipathes*? *columnaris* Brook, while as new species are described *Parantipathes tenuispina*, *Antipathes lata*, *Ant. densa*, *Ant. densiflora*, *Ant. pseudodichotoma* and an *Antipathes* n. sp.? — On the plates are given very beautiful reproductions of various colonies but in the text an inconvenient deficit of detailpictures is to be regretted,

the more disagreeable while the description is often very defective. The diagnoses, given by SILBERFELD for every species are very far from characteristic; in a genus as *Stichopathes*, poor as it is in sharply defined species and unmistakable characteristics, a diagnosis as given for *Stichopathes spinosa* Silberfeld: "Gekrümmte *Stichopathes* mit starken, etwa 280 μ hohen Dornen an einer Achse von über 1 mm. Durchmesser" is absolutely useless, especially where a description follows in which one can find little more than in the diagnosis. It is also a pity that SILBERFELD omits the height of the colonies, as a useless characteristic according to him, whereby he forgets that the thickness of the axis without the height is of little value, but in connection with the height can influence and define the habitus of the colony. — SILBERFELD concludes with a few short remarks about the geographical distribution.

In 1910 I described in the "Bijdragen tot de kennis van het genus Cirripathes" the Cirripathes-species collected by the "Siboga". After a critical review of the formerly described *Cirripathes*-species, I thought fit, by reason of the great variability I found by these and other Antipatharia I examined, to join *Cirripathes propinqua* Brook and *Cirr. flagellum* Brook with *Cirr. anguina* Dana; *Cirr. diversa* Brook with *Cirr. spiralis* (Linn.) Blainv.; further I let *Cirr.*? *paucispina* Brook and *Cirr.*? n. sp.? T. and S. intact, but both only by want of good data and through defective descriptions. The "Siboga"-material contained six new species, viz. *C. nana*, *C. translucens*, *C. contorta*, *C. musculosa*, *C. Rumphii* and *C. ramosa*, while the formerly described *C. anguina* Dana and *C. spiralis* (Linn.) Blainv. could be more sharply defined on all points through the examining of numerous specimen. *C. paucispina* Brook was represented by a dubious specimen. As in the systematic part of this book I shall repeat in the main the conclusions of these "Bijdragen", it will be sufficient to refer thither. Thanks to the mainly well preserved polyps, it was possible to examine the species in sections in the majority of cases, whereby facts were discovered which suggested the idea of regarding the division in Dekamerota, Dodekamerota and Hexamerota, introduced by SCHULTZE, as useless. Further I succeeded in various cases to find a clearly developed musclesystem on the mesenteries. This part I also repeat in this book, so that I refer thither; sometimes a further examination compelled me to an other view about the facts I found. — In the phylogenetic part I concluded that the Antipatharia may be considered as primitive forms, but the joining of Antipatharia and Ceriantharia to Ceriantipatharia I judged not desirable. — On the investigation of the *Cirripathes*-species I would rather found my belief that the branched colonies are not the phylogenetically younger forms, as ROULE says, but rather the unbranched colonies.

In the same year (1910) KINOSHITA described a new Antipatharian, viz. *Hexapathes heterosticha* n. g. n. sp., in the Annot. Zool. Japon. — The making of this new genus is a consequence of SCHULTZE's ideas about the systematic value of the number of mesenteries, since probably KINOSHITA, without this classification, would not have made a new genus. — The specimen in question is very nearly related to *Bathypathes*, especially to *Bathypathes lyra* Brook. Since there are only three pairs of mesenteries and the colony has a wholly other habitus than the hexamerote *Cladopathes plumosa*, KINOSHITA has made the new genus *Hexapathes*. — The specimen which forms genus and species comes from the Sagami-Bay.

SYSTEMATIC PART.

CLASSIFICATION.

BROOK's method of systematic classification of the Antipatharia (1)[1]) is criticised by SCHULTZE (6) in a very appreciative but at the same time very radical manner, so that SCHULTZE found it necessary to make a number of great changes in BROOK's system. He was of opinion that the system could be made more natural by paying less attention to the form and other characteristics of the axis, which are very subject to the influence of the surroundings as SCHULTZE could demonstrate with an instance of *Savaglia*, and by reckoning more with the anatomy of the separate individuals, especially the number and the place of the mesenteries, since in this respect a constant, hereditary condition exists. SCHULTZE does not hold the form of the colony absolutely valueless for the classification, but he will only make use of it for the distinction of lesser groups, by which however a conformity of colonies may be very well a phenomenon of convergency so that the result would be an artificial system; but we are less probable to make an error than by using the form of the colony as typical for the principal division. The family of the Dendrobrachiidae subsists without more. SCHULTZE proposes to subdivide the family of the Antipathidae, emendated by BROOK, into three subfamilies: Dodekamerota, Dekamerota and Hexamerota, according to the polyps having twelve or ten or six mesenteries. To the Dodekamerota appertains only the genus *Leiopathes*, to the Hexamerota only the genus *Cladopathes*, while KINOSHITA's *Hexapathes* would now also belong to it. The Dekamerota fall asunder in two unnamed tribes according to the polyps having peristomal folds or not, descending into the gastral cavity. To the tribe with peristomal folds belong the three genera *Schizopathes*, *Bathypathes* and *Taxipathes*, while the tribe without peristomal folds is subdivided into three subtribes, viz. the Crustosae, whose colonies form a crusty covering over foreign bodies and are only free for the matter of their ultimate branchlets, the Ramosae, whose colonies are branched and always free, and the Indivisae, whose colonies are also free but always unbranched. To the Crustosae belongs *Savagliopsis* and also SILBERFELD's genus *Tropidopathes*. The Ramosae contain the genera *Antipathes*, *Aphanipathes* and *Parantipathes*, while *Cirripathes* and *Stichopathes* appertain to the Indivisae. The genera *Antipathes* Brook, *Antipathella* Brook, *Pteropathes* Brook and *Tylopathes* Brook are joined by SCHULTZE in one genus *Antipathes* Pallas (emendated by SCHULTZE). SCHULTZE's argumentation is conclusive but

1) The numbers refer to the bibliography.

since there are more facts available now, I am of opinion that I am right in modifying some points in SCHULTZE's system, that until now has been followed by the other authors in their descriptions.

In the first place the division in Dodekamerota, etc. comes under closer consideration. Without doubt it is true that the mesenteries, as much as the rest of the anatomical structure, form a more solid foundation for the systematic classification than the external characteristics, but in my opinion SCHULTZE has given too large a systematic value to the *number* of mesenteries. According to BROOK the polyps of *Leiopathes glaberrima* contain three pair of secondary mesenteries besides the three pair of primary ones; the other *Leiopathes* species have never been examined at this point since the material was unavailable. After BROOK, ROULE i. a. (14) mentioned the existence of this extra-pair of secondary mesenteries, but also by the same species. Both authors declare explicitly that the third pair lies in a very regular way one on each side of the actinopharynx. VON KOCH (2) also observed these important secondary mesenteries; in the description of *Antipathes glaberrima* Esper, whose identity with *Leiopathes glaberrima* is evident, VON KOCH says (pg. 196): "Der innere Bau stimmt im Grossen und Ganzen mit dem der Gattungs-Verwandten überein, jedoch fand ich fast bei der Hälfte der genauer untersuchten Exemplare eine merkwürdige Abweichung hinsichtlich der Zahl der Parietes. Von diesen waren nämlich, statt wie gewöhnlich in jeder Hälfte 4 kleinere, hier in der einen 4, in der anderen Hälfte aber 6 kleinere Scheidewände vorhanden, also mit den grossen zusammen 12".

In the descriptive part of the introduction he remarks (pg. 189) about this question: "Bei einer Anzahl von Polypen von *Antipathes glaberrima* konnte ich neben den eben beschriebenen Scheidewänden noch zwei weitere nachweisen, die zwischen je einer grossen und einer kleinen stehen, aber merkwürdigerweise an allen von mir in Querschnitte zerlegten Exemplaren nur auf eine Seite beschränkt sind (vgl. Fig. 2). Wenn sie symmetrisch aufträten, was bei einzelnen Polypen als sehr wahrscheinlich vorausgesetzt werden kann, so würde die Gesamtzahl der Parietes bei *A. glaberrima* auf 14 steigen". In figure 2 he mentions, VON KOCH schematized this secondary mesenteries. In this VON KOCH starts from the supposition that the mesenteries are arranged symmetrically in pairs with respect to the sagittal axis, which he supposes to be perpendicular on the direction of the actinopharynx, and therefore coïnciding with the length-axis of the colony. This is in defiance of BROOK's system of axes, who was of opinion that this direction was the transversal axis and supposed that the long axis of the actinopharynx was the direction of the sagittalaxis. SCHULTZE says emphatically (6) that he only retains BROOK's denomination of the axes as he will cause no confusion, but that he thinks right the axis-denomination according to VON KOCH; after a more ample consideration of this question he says: "Die Sagittal-Ebene der Antipatharien-Person würde dann senkrecht zur Längsrichtung des abgeplatteten Schlundrohres orientiert sein". After SCHULTZE's own opinion the third pair of secondary mesenteries would have a very singular unilateral site and anyway the Dodekamerota should have been better called Tettareskaidekamerota. On ground of the musclesystem of the mesenteries, found by various Antipatharian species, I deem the axis-denomination after BROOK more correct than that after SCHULTZE-VON KOCH and in this case the objection to the name can be left out of the question since there are six complete pairs of mesenteries.

A more weigthy objection is the fact, twice recorded by VON KOCH (2), that not all the polyps of *Antipathes glaberrima*, but only half of the searched polyps have this third pair of secondary mesenteries, so that this characteristic has not an universal value for the whole colony, and within the boundaries of one and the same species twelve or ten mesenteries can occur; the heredity of this third pair of secondary mesenteries is in this case still extremely doubtful. — A second weighty argument against the retaining of the Dodekamerota I suppose to have found in the results of the anatomical research of one *Eucirripathes*-species, viz. *Eucirripathes contorta* van Pesch (22). In this *Eucirripathes* I found beside the normal ten mesenteries, which are regularly found in all the other investigated Antipatharia, an extra-pair of secondary mesenteries. They were missing in the upper part of the oral cone, but in the lower sections they appeared half way of the cone. They were not situated as by *Leiopathes* between the normal secondary mesenteries and the primary transversal mesenteries, but between the normal secondary mesenteries and the primary sagittal ones; they reach not to the wall of the actinopharynx and they descend lower than the other secondary mesenteries, even lower than the primary sagittal mesenteries. So there is a rather great difference between these secondary mesenteries and the third pair by *Leiopathes*; we have here a species, which not only can lay claim to the name of Dodekamerote, but also, according to SCHULTZE's opinion about the value of the mesenteries, could form a sub-tribe next to a sub-tribe, in which *Leiopathes* should be placed, or could even form a tribe next to the three existing tribes. I am indeed of SCHULTZE's opinion that the form of the colony is not of great systematic value, but not only in the form of the corallum *Eucirripathes contorta* v. P. is very like the other *Eucirripathes*-species, but also in the structure and anatomy of the polyps it differs but very slightly from the other species, so that in this case we would have a phenomenon of convergency on such an extensive scale that only one single pair of secondary mesenteries would be exempted. The external conditions can surely influence the form of the corallum, but not to such an extent that the colony becomes unbranched, while the internal anatomy will certainly not be influenced so much by external conditions and be hereditary to a high degree, at least equal to that one inferior part: the mesenteries. So I am more inclined, still giving a great systematic value to the mesenteries, to find the third pair of secondary mesenteries not so important that they may characterize a sub-family. I am of opinion that it will be better to abolish the Dodekamerota and to join them to the Dekamerota, wherein the genus *Leiopathes* on afterwards indicated grounds will be joined to *Antipathes*. The names of Dekamerota and Hexamerota are no longer fit, at least the former, and since I prefer to see the difference between these sub-families in their having secondary mesenteries or not (in any arbitrary number) next to the always present primary mesenteries, I intend to name the Hexamerota *Homoeotaeniales*, since only one sort of mesenteries is extant, and to join the Dekamerota and Dodekamerota of SCHULTZE in the *Heterotaeniales*, characterised by primary and secondary mesenteries too, therefore of different size. The Heterotaeniales are subdivided into two tribes, having peristomal folds or not, and which for the sake of easier indication can be called *Ptuchaephora* and *Aptuchaephora*, although I am somewhat reluctant in recognizing the importance of this folds, and I would not be very astonished if forms occurred, belonging to one of the genera of the Ptuchaephora, however

without having peristomal folds, for it is difficult to decide where an indentation between two thirdparts of a polyp ends and where a fold begins.

The Aptuchaephora contain the Crustosae, the Ramosae and the Indivisae, but here also I must object to the existing arrangement, made by BROOK and partly by SCHULTZE. Doubtless SCHULTZE's opinion about the desirability of the establishing of the subtribe Crustosae is more founded than BROOK's method, who described the hereto-belonging genus and species as an *Aphanipathes* (*A. pedata*) without giving the remarkable method of growth its full due. — SCHULTZE (6) suffers the subtribes of the Ramosae and Indivisae to be left intact, but I am of opinion that certainly this subdivision is not a natural one; in view of SCHULTZE's opinion about the small value of the form of the colony, I am somewhat surprised that he has taken this subdivision from BROOK. The research of the specimens collected by the Siboga has fixed my opinion that it is not desirable to retain the Indivisae as a sub-tribe. In the first place it is often not practicable to decide whether a specimen belongs to an unbranched or a branched species. In one case (*Euantipathes dichotoma*, specimen from station Kur) I had two colonies, without any doubt belonging to the same species, but one unbranched and the other branched. Regard the possibility, which certainly is not too absurd, of finding only the unbranched specimen; in this case I would certainly have considered it as a *Stichopathes*-species, unless we considered the form of the polyp rightly as of more importance; and that on this grounds I had put the colony in an *Antipathes*-species. — We come across this sort of cases more than once and it is conceivable that various *Stichopathes*-species, especially the smaller ones, are young and still unbranched colonies of branched species. Such a case occurred by *Euantipathes longibrachiata*; SILBERFELD (21) has described under the name of *Stichopathes japonica* a species from the Enoura-bay. This species was represented by colonies lacking the natural base, but as this occurs very often and as the colony was unbranched, it is easy to conceive that SILBERFELD described it as a *Stichopathes*. The Siboga-material contained an *Euantipathes*-species with exceedingly long branches, which themselves were further unbranched over a very long distance. Hereby I found some fragments, so long and also unbranched, that at first I considered them as a *Stichopathes*, but on further examination there was no possible doubt about their belonging to the branched colonies, as snapped of branches with a maximum-length of ninety cm.; the colonies showed a great number of such branches in sound condition. In the form of the corallum, the structure of the polyps, the characteristics of the spines and even in some anatomical points mentioned by SILBERFELD, the Siboga-specimen and SILBERFELD's fragments were so like each other that without any doubt both colonies are identic. It is evident that by accident SILBERFELD got only snapped off branches, and by the same accident of a species the branches of which are abnormally long. — So it is extremely difficult, from a practical point of view, to keep the Indivisae and the Ramosae asunder.

But there is still another objection. JOHNSON (9) makes mention of a specimen of *Stichopathes gracilis* Gray, with a spineless branch of 150 mm.! As a probable cause of this anomaly JOHNSON remarks that the true top is snapped off 4—5 inches above the branch, so that the colony has continued its growth in this manner. But the following data are found in normal and undamaged colonies; THOMSON and SIMPSON (15) observed in *Stichopathes papillosa*

T. and S. a knob-like projection, which indicates, in the opinion of these authors, the remains of a branch. The research of the Cirripathes-species, published by me at an earlier date (22), showed me that a number of those species exist, whereby branches can occur, truly in a very slight degree, but enough to abolish a profound difference between branched and unbranched species. *Eucirripathes Rumphii* van Pesch has warts on the colony, which hardly can be called branches, but one of which has a length of 0.5 cm., which may be called a branch, although the length of the colony is much greater (some metres). It is however remarkable that at the side of colonies showing these warts there are also colonies which show no trace of warts, although they were captured at the same station. — *Eucirripathes anguina* (Dana) shows unmistakable branches, which indeed remain very short (maximum length is 1.5 cm.) compared with the total length of the colony (there are specimens the length of which is 2.5 cm., though they are snapped off and their basis is lacking), but these branches have a typical top, so very much like the conical top of the colony itself, characterized by a typical, exceedingly increasing diameter, that it is impossible to suppose them to be accidental knots. In this case also colonies with these branches occur in the same species as colonies wholly lacking any trace of branches or warts. Perhaps it is not inappropriate to quote in this place the following remark of Rumphius from his Herb. Amb.: "Zomtijds ziet men op een of twee plaatsen van dezen steel een uitsteekende hoek of knop, als of er een tak had willen uitkomen, 't welk egter zoo niet en is, want ik heb nog den zwarten nog den witten Palmijuncus ooit in tweeën verdeeld gezien, hoewel de Moluccanen zeggen dat de uiterste draad zomtijds in tweeën klieft als een gaffel, welk einde, als gezegt, men nooit te zien krijgt, omdat het van de Visschers weggesmeten werd" (description of his *Palmijuncus marinus albus*, probably an *Eucirripathes*-species, which I am unable to identify). It is very doubtfull whether a characteristic, so very unstable within the boundaries of a species itself, and whereby a difference of only a few mm. exists between a wart and a branch, may be used as a valuable characteristic of a subtribe. At the utmost, the being branched or unbranched can be used to tell a lesser group from an other, but the lesser group the better since the possible mistake becomes of continually lesser importance. Opposite to the subtribe of the Crustosae I prefer to place only one single subtribe, including the former Ramosae and Indivisae, and which can be called the autonomously growing ones or *Autokresales*. — The external structure of the polyps, especially by *Stichopathes*, but also by *Eucirripathes*, is so manifold that I almost went so far as to join both genera to the branched genera, so that on ground of the polyp-structure branched and unbranched species could be united in one and the same genus, for certainly it is strange that *Stichopathes aggregata* and *Euantipathes dichotoma* with the same polyp-structure should appertain to different genera, while *Stichopathes Pourtalesi* and *Stichopathes abyssicola*, the polyps of which are very unlike each other, belong to one and the same genus. I did not join them however, although now and again I might have rightly done so, for until now the material of polyps is too scanty to make out the typical polyp-structure of a species or a genus. It seems to me, that, when later on we could pass on to this, for the time being only genera belonging to the Autokresales can be considered, in view of the structure and anatomy of the polyps, occurring by *Stichopathes* and *Eucirripathes*.

The separate genera require now to be examined. To the Dendrobrachiidae belongs only *Dendrobrachia* Brook which can be let unchanged and of which we know very little. To the Homoeotaeniales belong next to Brook's genus *Cladopathes*, Kinoshita's *Hexapathes* and my new genus *Sibopathes*. Brook's diagnosis of *Cladopathes* (1) can not be used in unchanged condition, since Brook's generic diagnosis, as is observed by former authors, not always give trustworthy generic characteristics. It is difficult, in a group so variable as the Antipatharia, not having an abundancy of characteristics, to strictly separate the generic and the specific qualities. So it is very doubtful if the "much-crowded polyps" are a generic characteristic, since by other genera within one and the same species the intertentacular distance of the polyps is very variable. Also of questionable generic value is "the very long stomodaeum, reaching nearly to the periaxial sheath of the sclerenchyma", and it is the same with the numerous folds of the stomodaeum. The thickness of the mesogloea is absolutely unavailable as generic characteristic since the influence of the fixatives and the preserving fluids on this thickness is very great. The mesogloeal cells I found in very divergent genera and often within one and the same genus as well as not at all. It is difficult to use the characteristics of the spines as generic characteristics, especially in view of the fact that only one species is on hand; the same can be said of the form of the colony and the mode of branching. Since only the habit of the polyps ("dimorphic zooids") and the existence of the only three pair of mesenteries remain as generic characteristics with the doubtful points: a cylindrical oral cone, a very long stomodaeum and a longest diameter of the stomodaeum not coïnciding with the sagittalaxis, it would be possible to unite Kinoshita's *Hexapathes* (23) with Brook's *Cladopathes*; the mode of branching of *Hexapathes* is very much like *Bathypathes lyra* Brook, but this not necessarily establishes a generic difference, since a case of convergency is not excluded. At the utmost the form of the colony of *Hexapathes* can indicate a nearer connection between these Homoeotaeniales and the Ptuchaephora, especially *Bathypathes* and herein the sub-genus *Eubathypathes*. The form of the polyps by *Hexapathes*: "polyps elongate in transverse axis; mouth situated on a high projection of peristome; stomodaeum long, nearly reaching the axis sheath; mesenteries six in number", is very much like those of *Cladopathes*. The different thickness of the mesogloea is not necessarily an objection to this assembling as I previously remarked. *Sibopathes* can not be considered as a near enough relation of *Cladopathes* and *Hexapathes* to unite them, since, as will be seen in the anatomical part of this book, the anatomy is very primitive so that the difference with *Cladopathes* is too great.

To the tribe of the Ptuchaephora appertain the genera *Taxipathes* Brook, *Schizopathes* Brook and *Bathypathes* Brook. Concerning the two latter genera it must be remarked that their union would certainly be very desirable. While *Taxipathes* at least is easily distinguishable by its peculiar mode of branching *Schizopathes* and *Bathypathes* are very much like each other in this and other respects, viz. next to the mode of branching the form of the spines and the polyps, also the anatomy e. g. the very thin mesogloea and such like. — Both these genera with their pinnate mode of branching chiefly differ in the form of their base. The base of *Schizopathes* is not fixed to an other object but free, flattened and tapering, more or less hooked up at the extremity, while the colony of *Bathypathes* is fixed in the normal manner

to foreign bodies by a dilated base. Till now the free base is only found by two species of *Schizopathes*, both of which I unite into one species, while the third species (*Schiz. conferta* Brook) misses the base and so the generic character also. Further the polyps of *Schizopathes* are more crowded than by *Bathypathes*, although nearer the base of the *Schizopathes*-species the interpolypar distance increases. *Schizopathes* has a sagittally elongated stomodaeum, while the oral cone is a prominent cylinder; by *Bathypathes* "an elongation of the stomodaeum in the sagittal axis is never marked; usually its greatest length corresponds to the transverse axis of the gastrozoid" (**1**). Moreover: "the mouth opens on the general surface of the peristome, or is situated on the apex of a short conical or cylindrical projection of it". By *Schizopathes* the polyps are so crowded that there is no isolation of the zooids into triplets, the interpolypar distance is just as great as the distance between the pairs of lateral and sagittal tentacles; by *Bathypathes* the polyps are at a greater distance apart, which occurs by *Schizopathes* only in the lower part of the colony, where the polyps are "separated from one another by a considerable interval as in *Bathypathes*" (**1**), and where the zooids are degenerate. As a farther generic characteristic is mentioned that the ova of *Bathypathes* are very large and each inclosed in a special mesogloeal chamber; by *Schizopathes* nothing of this is mentioned, even in the anatomical part, but by *Taxipathes* Brook mentions large ova without special mesogloeal cyst, at which he says that in the structure of theovaries *Taxipathes* differs from *Schizopathes*. — On examination of all these generic differences, it appears first that Brook himself already says that the polyps in the lower parts of *Schizopathes* are separated from one another by a considerable interval, which fact lessens the difference between crowded (*Schiz.*) and not-crowded polyps (*Bath.*); this is made more striking by the Siboga-material of *Schizopathes* (*Schiz. affinis* Br. by me united to *Schiz. crassa* Br.) whereby the polyps are so far apart that with the naked eye it is clearly visible which pairs of tentacles belong together as one polyp (Brook's "triplets of zooids"). — The high oral cone, typical for *Schizopathes* as Brook's opinion is, and wholly or nearly wholly lacking by *Bathypathes* I also found by the specimen of *Eubathypathes patula* Br. described by me, crateriform and as high, if not higher, than by *Schizopathes*. By other Antipatharia moreover it is to be remarked that the height of the oral cone often depends on a high degree on the state of preservation, or at least is very variable within the boundaries of one and the same species. — The difference in stomodaeum, lessened by Brook's own description of its condition by *Bathypathes*, is made less striking since the mouth, usually transversally elongated by *Bathypathes* and not described by Brook for *Schizopathes*, is by the Siboga-specimen of *Schizopathes* either round or also somewhat transversally elongated. — The ova, not clearly described for *Schizopathes*, are very large by the specimen I examined, larger than by *Bathypathes*, and each ovum has its special mesogloeal chamber, just as Brook found by *Bathypathes*. — By *Schizopathes* Brook gives as a generic characteristic its having ten mesenteries in the "gastrozoid" and only one in each of the "gonozoids" but this is not a generic characteristic for on another page he gives this point rightly as a distinctive of the entire subfamily of Schizopathinae Br. so that *Bathypathes* and *Taxipathes* share alike in this characteristic. — Apart from the question whether all this points are of generic value, the difference between *Bathypathes* and *Schizopathes* is reduced to the fixing of the colony-base and

to the basal elongation of the stomodaeum, both of which characteristics are in my opinion only sufficient for a specific difference but not for a generic difference. I am inclined to unite both these genera in one, under the name of *Bathypathes* wherein Brook's *Bathypathes* can at the utmost form a sub-genus *Eubathypathes* and *Schizopathes* Br. can appear as a second sub-genus. I must add that by examining more ample material one might weld this sub-genera wholly without further sub-division except into species. The genera *Savagliopsis* Schultze and *Tropidopathes* Silberfeld, belonging to the Crustosae, in the tribe of the Aptuchaephora, are each represented by only one species, and although after the examining of more ample material it will be easier to discern between generic and specific characteristics, we must for the present abide by the opinion of Silberfeld (**21**) who gives as generic difference between *Tropidopathes* and *Savagliopsis* the concrescence of the spines on one side of the axis to a continuous crest. — We doubt very much whether the spines have a generic value (as to the formation of a crest by the spines cf. *Parantipathes tristicha* sp. n. on part of the stem but not on the entire colony, and Brook's *Bathypathes quadribrachiata* = *Eubathypathes quadribr.*), but for the moment this would be still uncertain; however it must be remarked that from both genera the polyps are unknown, so that there would be negative arguments enough to speak of *Savagliopsis saliciformis* Silberfeld. But I will readily leave the decision to the examiners of less concise material.

To the Autakresales appertain all the other genera, viz. *Leiopathes* M. Edw. and H., *Antipathes* (Pallas) Schultze, *Aphanipathes* Brook, *Parantipathes* Brook, *Stichopathes* Brook and *Cirripathes* (Blainv.) Brook. In my opinion these genera can not be left unchanged. To begin with the unbranched genera *Stichopathes* and *Cirripathes*; after Brook (**1**) these genera differ principally in the distribution of the polyps on the colony-axis. By *Cirripathes* they are placed on all sides of the axis, never in a single linear series and by *Stichopathes* on one side of the stem only. As secondary generic characteristics are given by Brook for *Cirripathes*: usually rounded polyps with six tentacles arranged in a radiate manner; a more or less prominent oral cone which may show a basal constriction; five pairs of mesenteries in the oral cone and three below; the coenenchyma contains a system of canals which takes a direction chiefly at right angles to the axis of the stem. From these characteristics the number of mesenteries in and below the oral cone may be dropped for this is no generic speciality of *Cirripathes* but of all possible genera. By *Stichopathes* is given: six very long digitiform tentacles; polyps well developed, sometimes alternately large and small, in which case the smaller ones are hidden by the long tentacles of the larger polyp; transverse canals on the back of the stem, between successive polyps. — Hereby it is immediately to be noticed that Brook, as he remarks himself, could observe no polyps, since the Challenger had found no *Stichopathes*-species; in the collections of the British Museum only one species had dried polyps but there were no polyps preserved in spirit. Investigating the forms of polyps occurring by the Siboga-specimen of *Stichopathes*-species, it strikes immediately how the generic polyp-qualities given by Brook only occur as specific characteristics but that it is out of the question that all these characteristics are due to every *Stichopathes*-species and besides that they mostly depend from the preservation. — At the utmost it would be possible to give a generic value to the alternation of old and young polyps and the transverse boundary-canals between the polyps, as these characteristics occur

generally, (but not without exceptions) but I saw these qualities also in various other genera, in *Eucirripathes* too. As I remarked before the form of the polyps is too varying to be fit for generic differences. — As the principal difference the distribution of the polyps remains. But even to this regard both genera are not sharply separable; as I remarked in my publication on the genus *Cirripathes* (22), various colonies (*Eucirr. Rumphii* v. Pesch, *Eucirr. spiralis* (Linn.) Blainv., and *Eucirr. musculosa* v. Pesch) which ordinarely have a polyserial distribution of polyps round the axis, have an uniserial polypdistribution on the top of the colony over a distance, which is a not unimportant part of the whole length of the colony. While this fact occurs in older colonies, younger specimen sometimes show along the whole length of the colony an uniserial distribution. Of course the practical conclusion of this is that, especially by the minor colonies, it is very probable that *Eucirripathes*-species are described as *Stichopathes.* — Also it is possible that in some cases it is difficult to take a decision; e. g. *Eucirripathes musculosa* is very much like *Stichopathes variabilis* (Silb.) n. n. not only in external structure but also in anatomy. By *Eucirr. musculosa* however the polyps are not arranged in one series but irregularly round the stem, while *Stich. variabilis* (Silb.) has an uniserial polypdistribution; Brook would have them considered as two indisputable species. However by *Stich. variabilis* (Silb.) there are, truly rarely, curves in the series of polyps, sometimes even turning once round the entire stem; so the difference with *Eucirripathes musculosa* is so slight that I would have united both species if not anatomical differences e. g. the muscles of the mesenteries, joined the differences in polyp-distribution. — So it would be feasible to unite both genera when not very large and clearly older colonies occurred, having an uniserial polypdistribution over their total length; therefore it is less improbable that this characteristic is a natural one. As however both genera are very nearly related, it seems to me desirable to consider *Cirripathes* and *Stichopathes* as sub-genera of a genus *Cirripathes*, which name I retain since the unbranched colony becomes the principal characteristic; *Cirripathes* Brook can as sub-genus wear the name of *Eucirripathes.* The sub-genera differ in the distribution of the polyps round the stem. — *Cirripathes ramosa* v. Pesch (22) is a species, whereby very rare but well developed branches exist; not lower than one metre above the broken base a dichotomy occurs in two equivalent branches, both many dm. in length, while only one of them shows a trace of a second branching; the habitus is wholly like that of other *Cirripathes*-species. Although in my publication on the genus *Cirripathes* I have called this branched species *Cirripathes*, I do not think it desirable to keep it in this subgenus. The branches, although they are very sparingly distributed, are so much longer than in the other *Eucirripathes*-species where branches occur, and in a so much more normal proportion to the length of the colony that it will be better to keep them apart, so that the former *Cirripathes ramosa* v. Pesch now appertains to a new genus *Hillopathes*, which in the distribution of the polyps round the axis, or rather in a non-uniserial arrangement, combined with a decidedly branched colony is a transition from *Antipathes* (especially *Euantipathes*) to *Eucirripathes.* — One of Brook's species incertae sedis is joined by me to this new genus.

The generic characteristics of *Leiopathes*, given by Brook (1), are principally the very slight development of the spines and the sixth pair of mesenteries. — The other generic qualities have in my opinion very slight weight, since the number of species, as yet very scanty, diminishes very

much by nearer examination. As I was obliged to give a critical review of the until now described *Leiopathes*-species, by my description of species, it is not necessary to repeat this description in extenso here, but I can point out my conclusions, viz. I have joined *Antipathes glaberrima* Esper, described by von Koch in his Antipathidae of the Bay of Naples (2), *Leiopathes Grimaldii* Roule (14), *Leiopathes expansa* Johnson (9) and *Leiopathes glaberrima* Esper (1) to *Antipathes glaberrima* Esper with the following species-diagnosis: colony with angular bends, branched irregularly and in high degree, often elliptical in section, black, on the older parts polished and glossy, branches at right angles to the branches of lower order, sometimes in one plane, interbranchial distance max. 2 cm., length of the ultimate branches max. 3 cm.; spines only on the younger branches, triangular, in 4 rows, length 40—75 μ, distance 400—800 μ, at right angles with the axis; polyps with dome-shaped oral cone and round or sagittally elongated mouth, sagittal tentacles 0.8—1.5 mm., lateral tentacles 0.5—1 mm., sagittal tentacles at a lower level than the lateral ones, length of all the lateral tentacles is the same, sagittal tentacles often horizontally projecting, lateral ones vertical or lying against the oral cone; yellow, red to warm brown. — On comparing this diagnosis with the characteristics of other *Antipathes*-species e. g. *Euantipathes dichotoma* (Pallas), whereby the very variable qualities must be kept in view, which I placed together in the table of *Euantipathes dichotoma* (Pallas), there is so great a likeness between both species that at first I was inclined to join both species. At all events the difference between *Euantipathes dichotoma* (Pallas) and the species of *Leiopathes* is not so great as between various *Antipathes*-species mutually. Almost every characteristic of *Leiopathes glaberrima* is represented in *Euantipathes dichotoma* (Pallas), except the extreme poverty of spines on the older parts of the colony. The typical curvature of the branches in an opposite direction to the branches of higher order, mentioned by Roule (14) for *Leiopathes Grimaldii*, is also present in various specimen of *Euantipathes dichotoma* (Pallas) (table: spec. IX). However the number of mesenteries is a clear difference between *Euantipathes dichotoma* and *Leiopathes glaberrima*, but in my opinion it is not desirable to keep *Leiopathes* intact as a genus, merely on ground of the relative poverty in spines and a difference in mesenteries, which difference, as is demonstrated by an *Eucirripathes*-species, not only can occur within the boundaries of a genus, but which, as is demonstrated by von Koch's formerly quoted words, occurs only by half of the polyps and so is not even constant within the boundaries of the species itself. — It is better to join the genera *Leiopathes* M. Edw. and H. and *Antipathes* (Pallas) Sch. in a single genus *Antipathes*.

Something like this must take place with the genus *Aphanipathes* Brook, retained by Schultze, with the diagnosis (6): polyps obscure, oval, frequently hidden by the elongate spines; tentacles very short; corallum pinnate, paniculate or flabellate, with or without confluence of parts; spines elongate and slender. — Typical is the perforation of the polyps by the long spines. An objection is that the perforation of the polyps (better: the visibility of this perforation) is very subject to the condition of preservation and certainly it is possible to say with Schultze: "der Weichkörper der Person wird ganz normalerweise von den Dornen der Skeletaxe durchbohrt", but if there is only one single colony, as often is the case, it is very difficult to decide whether or no its condition is the normal one. — In the second place I can see only a gradual difference between the spines perforating the polyps or not, since in most cases,

wherein the gastral cavity is very narrow so that the body-wall and the periaxal sheath nearly touch each other, perforation of parts of the polyps by the spines occur. Again and again the anatomical examination of very diverging species and genera proved that the entodermal and mesogloeal sheath of the spines melt together with the body-wall and lift it up. — In my opinion it would be difficult to find a species which does not show this phenomenon at all. If one would use the term "perforating" only when the higher parts of the polyp viz. the oral cone and the tentacles are attained, I have only to say that this is also the case with many species of various genera, for instance specimen of *Stichopathes variabilis* (Silb.) n. n. appertaining to the *var. longispina* and other varieties, which also have very long spines. — The number of species, described by Brook and having well-perforated polyps is very small, since only two out of the fifteen described species, viz. *Aph. sarothamnoides* and *Aph. cancellata*, had polyps which could be examined. Following Brook's descriptions (1) and figures, there are doubtless some species which have very developed spines, but there are also many species which are not especially abnormal in this regard and the polyps of which will be perforated or not, depending from the preservation, just as is the case with other genera. — The state of the spines of *Aphanipathes humilis* Pourt., as Pourtalès depicts them, is truly very singular and will not be mixed up with the normal condition of the spines in other Antipatharia, and in the Siboga-material there are also such species which exceedingly long and numerous spines, forming dense moniliform dilations of the axis in the region of each polyp, e. g. *Aphanipathes undulata* sp. n. and *Aph. reticulata* sp. n., but for many other species of Brook's list this question cannot be decided, which is not to be wondered at, as the term "sessile", used by Pourtalès for some polyps, is the only reason which made Brook put them down as *Aphanipathes*-species. — That I am not the only one who is of this opinion, is made apparent by the following quotation of Forster-Cooper: (12) "the difference between the two genera *Antipathes* and *Aphanipathes* appears to me to be founded on very slight grounds. The main point distinguishing them lies in the fact that in the latter the spines are longer in the polyp areas and penetrate into the polyps themselves. In view of the fact that in some forms of *Antipathes* the spines are irregular in size and often very variable in different parts of the corallum, it seems that too much stress must not be laid on this point of difference. The other characters used by Brook to define the genus are also equally useless: ""Polyps small and inconspicuous"", ""more or less oval outline"", ""tentacles usually very short"" can all be applied to different species of the sub-orders *Antipathes* and *Antipathella*, the latter of which has already been merged into the former by Schultze. Probably further knowledge of the group at present under consideration will lead to the same fate". — Although Forster-Cooper is in the wrong where he says that Brook's *Aphanipathes* must have longer spines in the polyp areas, for this is a characteristic only given for the subsection B (pg. 122 of the Challenger Report) but not for subsection A, I am very much inclined to accept his conclusions. The *Aphanipathes* which he describes and figures, *Aph. plantagenista* F. C., has also spines which are very normal for an *Antipathes*, and differs from *Aphanipathes sarothamnoides* Brook only in its possessing polished spines. — Since there can be given no essential difference between *Antipathes* and *Aphanipathes*, a nearer relation of both genera is not to be avoided. It will not be necessary to merge them into one,

but it is not desirable to consider them as farther related than as sub-genera at the utmost. — In my opinion it will be best to include in the sub-genus *Aphanipathes* only those species which really have exceedingly long and numerous spines so that each form of polyp would be easily and thoroughly perforated by them, as is the case in the above-mentioned species *Aph. humilis* Pourt., *Aph.* (?) *Somervillei* F.-Cooper, *Aph. reticulata* sp. n., *Aph. undulata* sp. n. etc., while the other ones can be added to the sub-genus *Euantipathes*, which is made by merging *Leiopathes* into *Antipathes*. Both these sub-genera constitute the genus *Antipathes.* — However it is necessary to make a reservation since in Brook's list of *Aphaniphates* also species occur, which in their mode of branching are very much like other genera. So is mentioned by Brook *Aphanipathes* (?) *abietina* (Pourt.) of which a very beautiful figure is given by Pourtalès himself on his Pl. IX fig. 10. — This colony is branched in the very same manner as is distinctive of the genus *Parantipathes*; the principal stem bears the unbranched pinnules on all sides and besides there are on every specimen one or two wormtubes. The only reason which Brook gives for placing this species not by *Parantipathes* but by *Aphanipathes* is that Pourtalès describes the polyps as shorttentacled and surrounded by larger spines than those on the rest of the pinnule. — I should like to exclude this species of the union of *Antipathes* and *Aphanipathes* and to join it to *Parantipathes* where it clearly belongs to, although the type of the polyp is very vague: other *Parantipathes*-species often have also very short-tentacled polyps. Also *Aphanipathes* (?) *filix* (Pourt.), mentioned by Brook, would be added to *Parantipathes* since the principal difference between *Aph. filix* and *abietina* is, according to Brook, whether or not the position of the pinnules is verticillate. — *Aphanipathes* (?) *barbadensis* Brook would also be included into *Parantipathes*, as, according to Brook, it recalls the habit of *Parantipathes larix* "from which indeed it is undistinguishable at first glance" (1). However there are five instead of six rows of pinnules, which are not simple everywhere. The secondary pinnules "recall the more complicated arrangement in *Parantipathes hirta* (Gray)". The difference in length of the spines is not very great if in this respect we compare Brook's figures (1 Pl. XI, fig. 1 and fig. 4), while the polyps of this *Aph.*-species are unknown; also in this case we should call it *Parantipathes barbadensis* Brook. Perhaps *Aph. alata* Brook and *Aph. wollastoni* (Gray, MS.) have to suffer the same fate but it is not necessary to give more instances here of the manner in which Brook's genus *Aphanipathes* ought to be divided.

Parantipathes Brook is also kept intact by Schultze (6), with the diagnosis: "Person in der Richtung der Skeletaxe stark verlängert (die Sagittalaxe des Körpers beträgt nur $^1/_3$ oder $^1/_4$ der Transversalaxe). Tentakel isoliert stehend zu drei weit von einander entfernten Paaren geordnet". So this type of polyp is very well to be distinguished from the type of polyp of *Antipathes*, although one should keep in view that an elongation of the polyps in the direction of the colony-axis can also occur on the younger branches of *Antipathes*-colonies, where this elongation is made necessary by lack of space. Brook (1) gives other generic characteristics besides, e. g. "a simple or rarely branched stem with simple spiral or verticillate branches"; so the whole colony acquires a bottle-brush appearance. This type occurs also in various species, described by Brook as [*Antipathes*]-species, viz. in his group B Antipathidae cupressoides, whereby "the corallum is more or less cylindrical, of the bottle-brush-type" (1) — It is true that [*Antipa-*

thes] *cylindrica* Br. has branched pinnules, but via *Parantipathes tristicha* sp. n., which has three rows of pinnules, one of which is branched regularly while both the other rows are unbranched, there is a connection between the *Parantipathes*-species with unbranched pinnules and [*Ant.*] *cylindrica*, the mode of branching of which has become irregular. Also the wormtubes in the colonies of [*Ant.*] *cylindrica* are in accordance with those of the *Parantipathes*-colonies. Polyps are absent, which makes it difficult to take a decision but for the time being there is no conceivable reason to keep apart this [*Ant.*]-species, so that we may call it *Parantipathes cylindrica*. — In the same manner [*Ant.*] *spinescens* Gray can become *Par. spinescens*, at the same time as its *var. minor* Brook; [*Ant.*] *squamosa* Koch becomes *Par. squamosa* and *Antipathes spinosa* (Carter): *Parantipathes spinosa* (Carter). — This genus *Parantipathes* can be considered as a connection between the Aptuchaephora (especially the Autakresales) on the one side and the Ptuchaephora on the other side, for *Parantipathes tristicha* sp. n. is in many points very like *Bathypathes*-species, especially *Eubath. quadribrachiata* sp. n. The two rows of unbranched branches, not wholly in one plane, are present in both species, while the two rows of short branchlets, which are to be found in *Bath. quadribrachiata* sp. n. may be compared with the single row of branched branches of *Parantipathes tristicha* sp. n., which row has the double number of branches compared with the rows of unbranched branches, and in this manner gives the impression of resulting out of the melting together of two rows.

The subdivision of the Antipatharia I conceive as follows:

Family ANTIPATHIDAE Verill (em. Brook).

1st sub-family Homoeotaeniales. Only primary mesenteries.
(= *Hexamerota* Schultze):
Sibopathes n. g.
Cladopathes (Br.) em.
(= *Clad.* Br. + *Hexapathes* K.).

2nd sub-family Heterotaeniales. Primary and secondary mesenteries.
(= *Dekamerota* Sch. + *Dodekamerota* Sch.).
1st tribe **Ptuchaephora** with peristomal folds.
Bathypathes (Br.) em.
Schizopathes Br.
Eubathypathes (Br). n. n.
Taxipathes Br.
2nd tribe **Aptuchaephora** without peristomal folds.
1st subtribe Crustosae Sch. The colonies form a crust on foreign objects.
Savagliopsis Sch.
(**Tropidopathes** Silb.).
2nd subtribe Autakresales with autonomous colonies.
(= *Ramosae* Br. + *Indivisae* Br.).

Antipathes (Pall.) emend.
Euantipathes n. n.
(= *Ant.* Pall. + *Leiop.* Gray).
Aphanipathes (Br.) em.
(= pars *Aph.* Br.).
Parantipathes (Br.) em.
(= *Par.* Br. + *Aph.* Br. + pars [*A.*] Br.).
Hillopathes g. n.
Cirripathes (Br.) em.
(= *Cirr.* Br. + *Stich.* Br.).
Stichopathes Br.
Eucirripathes (Br.) n. n.

Family Dendrobrachiidae Brook.

Dendrobrachia Br.

The generic diagnoses are:

Sibopathes g. n. No secondary mesenteries. Tentacles in three pairs. Mouth sagittally very much elongated, on top of an elongated cone, higher at the sagittal ends. — Very primitive anatomy (no actinopharynx).

Cladopathes (Brook) em. No secondary mesenteries. Tentacles in three pairs. Mouth obliquely elongated. High oral cone. Anatomy not very primitive (actinopharynx is present). Longest diameter of the actinopharynx coincides with the transversal axis.

Bathypathes (Brook) em. Tentacles in three pairs; the three parts of the polyp pertaining to them are separated from one another by deep depressions. Colony with principally two rows of long unbranched branches, nearly in one plane. (Spines short triangular.).

Sub-genus *Eubathypathes* (Br.) nom. nov. Base attached to foreign objects.

Sub-genus *Schizopathes* Br. Base free and hooked.

Taxipathes (Brook) em. Tentacles in three pairs; the three parts of the polyps pertaining to them are separated from one another by deep depressions. The mode of branching of the colony is not so simple as by *Bathypathes*; the branching is irregular, the branches have secondary branches. (Spines not short and triangular.)

Savagliopsis Schultze (Polyps?). The branched colony, except the ultimate branches, forms a crust on foreign objects. Spines not concrescent to a continuous crest.

Tropidopathes Silb. (Polyps?). The branched colony, except the ultimate branches, forms a crust on foreign objects. Spines form on one side of the axis a continuous crest.

Antipathes (Pall.) em. Polyps rounded or elliptical. Tentacles not isolated in pairs but more crowded. Colony branched.

Sub-genus *Euantipathes* nom. nov. Spines wholly or partly (in thinner places) concealed in the soft parts and at the utmost dimly to be seen through them.

Sub-genus *Aphanipathes* (Brook) em. Polyps are thoroughly perforated, in all parts, by the long crowded spines.

Parantipathes (Brook) em. Polyps elongated in the direction of the colony-axis; tentacles in three pairs. Colony branched in bottle-brush-form.

Hillopathes g. n. Polyps distributed, as in *Eucirripathes*, non-uniserially. Colony very sparingly branched.

Cirripathes (Br.) em. Colony unbranched or at the utmost bearing insignificant branches. Polyps in one or more longitudinal rows; rounded, with tentacles in a group.

Sub-genus *Eucirripathes* (Br.) em. Polyps on the older parts of the colony or on the whole colony in several rows, placed round the axis or leaving one side of the axis free.

Sub-genus *Stichopathes* Br. Polyps always placed in one single row.

METHOD OF DESCRIPTION AND THE MATERIAL.

The characteristics, used for the distinguishing of the species, are in the main the same as those Brook and other authors made use of, save that the nature of the material made it possible in this case to reckon in the first place with the polyps by preference. The place and form of the tentacles, the existence of an oral cone and its form, the interpolypar distance are characteristics which can easily be described with words and numbers; also the length of the tentacles is of importance, although this character becomes unreliable through the difference in contraction, in consequence of the preservation. Within not too narrow boundaries, and as a minor characteristic, the length of the tentacles is efficient. As to the hard parts of the colony, viz. the axis and its spines, the mode of branching of the axis is of importance, especially when various specimen are under observation; by the unbranched species not only the whether or not spiral form but also the differences in diameter of the axis come under consideration. The spines can be an easy means of recognition, but only if one attaches not too much importance to them; one should pay attention to the form and the distribution of the spines. The form can vary with the length of the spines on different sides of the axis, whereby usually the longest and roughest spines stand on the polyp-bearing side of the axis, but it appears that this variation is dependent on the form of the colony, for the different length of the spines is especially observed on spiral colonies, so that Roule's (14) opinion that the spines in the first place serve to give a good hold for the polyps, is not wholly unassailable, although there is some probability in it. The distribution of the spines is of minor importance since not only the number of longitudinal rows can increase very much on older parts of the colony, but also since the rows are often shifted. Hence the so-called spiral distribution of the spines is especially of no importance; it is often used by former authors and rightly condemned by Roule (14). The most natural distribution is that the spines are placed at the same distance one from another and this is best acquired when they form a quincunx. This quincunx also exists by almost all the observed species, sometimes made less clear by shifting of rows but in most cases easily to be seen. The consequence of this quincunxial arrangement is that always there are a sinistrorsal and a dextrorsal spiral to be observed, ascending under the same angle by a straight quincunx, and under a different angle by a slanting quincunx. So it is not possible

to speak only of one single spiral, and even more impossible to make use of this spiral as a specific characteristic.

Further the anatomical structure of the polyps is also made use of, but although I laid much weight to this factor, I used it sparingly in the specific diagnoses, from obvious practical reasons.

As much as possible with the description of the characters I made use of numerical data, for especially in the older descriptions the lack of objective numbers is to be regretted because of the subjective opinions of: "rather long", "rather thick", "rather distant", etc. SCHULTZE, and after him ROULE, also followed this safer method of stricter description. — As to the method of measuring, as a rule I measured the length of the spine from the middle of the base of the spine as far as the top of the spine, while the distance between the spines is given between the middle of the bases of two successive spines from the same row. The number of longitudinal rows is always given for one aspect of the axis, whereby I always paid attention whether the bases of the spines of the row were visible; the rows the spines of which were only visible as far as their apex, did not count, as was the case with many former authors, since, through the very great variability of the length of the spines, in this manner statements are compared which must not be compared at all; if all other data were the same, one species with long spines would have more longitudinal rows, visible from one aspect, than a short-spined species.

As type of a spine I took the spines on those parts of the colony where the spines have their maximal development, since, as BROOK (1) remarks, the spines at the top of the colony are not fully developed and in the basal part of the colony are often already diminished in length, since the axis increases with thicker layers as the spines themselves.

The interpolypar distance is measured between the middle of the oral cones of the most neighbourly polyps if they are not placed in rows; if they are placed in a row, the distance is measured between the bases of the sagittal tentacles of two succeeding polyps out of the same longitudinal row (intertentacular distance). Like SCHULTZE I have retained the terminology of BROOK, regarding the sagittal and transversal body-axis, therefore the sagittal axis at right angles with the colony-axis, while I call sagittal tentacles, the pair of tentacles at the end of the sagittal axis, and lateral tentacles, the two pairs at the end of the transversal axis.

When colonies, only differing in minor points, come from different stations, I have often described the colonies from each station separately. In this way the great variability is made more evident and it is also easier to interpolate formerly described species into the series of variability or to unite formerly described species by way of the Siboga-material. Often I have availed myself of this possibility of uniting, as in my opinion again and again variants are described as species, since the very great width of the variability of the Antipatharia was not known. Once this variability given, stated by an extensive material every time coming from one and the same station, and knowing the fact that from many species there is only one single colony extant from various localities, we can easily imagine that through the influence of the external conditions, which doubtless will be considerable for these sessile colonies, seemingly

different species are formed, which can not even be considered as local species, but only as accidentally very extreme variants of one and the same species.

By the so-called Indivisae I prefaced the description of the Siboga-specimens by a critical review of the formerly described species of *Eucirripathes* and *Stichopathes*, since especially in these genera a host of colonies was described as new species, and none has taken the trouble to group them. — With the branched genera I did not find this so very necessary; the joining of older species and a critical review of them might be inserted whenever it seemed necessary. The Siboga-material, truly very rich in unbranched specimens, opens a better prospect on good results in this department as in that of the branched colonies. There are many of these but not so many as to permit a grouping together of all the formerly described species, especially as these descriptions, even those of very young date, often are very defective and so wholly inefficient and useless.

Some of the colonies are dried but the greater part of the specimens are preserved in spirits, so that in most cases it was possible to reckon to such a high degree with the polyps by the description of species. For the macroscopical examining this method of preservation leaves nothing to be desired; it is very much to be appreciated that by large colonies at least a small part was preserved in spirits and the rest dried. — Of course the colour of the polyps was wholly lost, so that I was forced to leave it out of account with the following descriptions and comparisons of species.

DESCRIPTION OF SPECIES.

ANTIPATHARIA H. Milne Edwards.

Family Antipathidae A. E. Verrill (em. Brook).

1st Subfamily Homoeotaeniales s. f. n.

Sibopathes g. n.

1. *Sibopathes gephura* sp. n. (Pl. VIII, fig. 1).

Stat. 280. 8° 17'.4 S., 127° 30'.7 E. East of Timor. 1224 M. 1 spec.

The length of the colony, snapped off at the base, is 1 dm.; the length of the principal stem is 7.5 cm., which is very slightly curved, and densely branched. In the first place there are two rows of branches nearly lying in a plane; the interbranchial distance in a row is about 3 mm. and varies but slightly. The branches alternate regularly left and right, but the branches of one row are inserted just a little above the middle of the distance of two branches from the other row. Each row is composed of 26 branches. The length of the lower branches is ± 7 mm., which increases to ± $1^1/_2$ cm. for the higher ones; but this holds good only for the unbranched ones for the 6th, 13th and 18th branches on the right side (right and left are taken, facing the polyp-bearing aspect of the colony) bear pinnules, and evenso the 5th, 6th, 15th,

17th, 19th and 22nd branches on the left. The 5th and 17th are only slightly branched and not much longer than the unbranched ones; the other pinnules-bearing branches are much longer, from 1.5—4.5 cm., and greater in diameter. The angle between branches and stem is always 60°; all branches are curved slightly distally and backwards, especially in the top-part of the colony. The length of the pinnulae is at the utmost 9 mm. by the lower branches and the distal pinnulae decrease in length. On the higher branches the proximal pinnulae are ± 1 cm., and the more distal ones increase at first to 1.5 cm., but decrease towards the top of the branches; this increasing and decreasing does not take place regularly. All pinnulae are distally curved and very seldom they are straight. Besides the two described longitudinal rows there are two more rows, one on the front and one at the back of the colony, both in the same plane, which makes an angle of somewhat less than 45° with the plane of the other rows; in the distal part of the colony this angle slightly increases. The branches of the front row are simple with one exception which only bears two pinnulae. The number of branches is the same as in the first two rows, and all of them are placed almost at the same level as the left row. Their length increases distally from 6.5 till nearly 20 mm., but every time shorter branches occur between the longer ones. By the base of two branches another is inserted on the stem, at right angles to the principal rows, and some other branches occur at an angle of 30° with the right row. The row at the back of the colony is in every respect like the front row, but is inserted nearly at the same level as the right row; all branches of both rows are distally curved.

The pinnulae on the principal rows are also placed in four rows, every time two in the same plane; this planes are at an angle of 45°. The distance between two pinnulae is ± 2.5 mm.; they are at an angle of 60° with the branch and are distally curved. The two rows of pinnulae, which are at an acute angle, are on the same level; the two rows which are at an obtuse angle shift just like the branches on the stem. Some pinnulae of neighbouring branches cohere, but positively it is no concrescence of the axis. The diameter of the stem is 0.85 mm. at the base and gradually decreases to the top, which ends 3 mm. above the last branch; the diameter of branches and pinnulae is in proportion to their length.

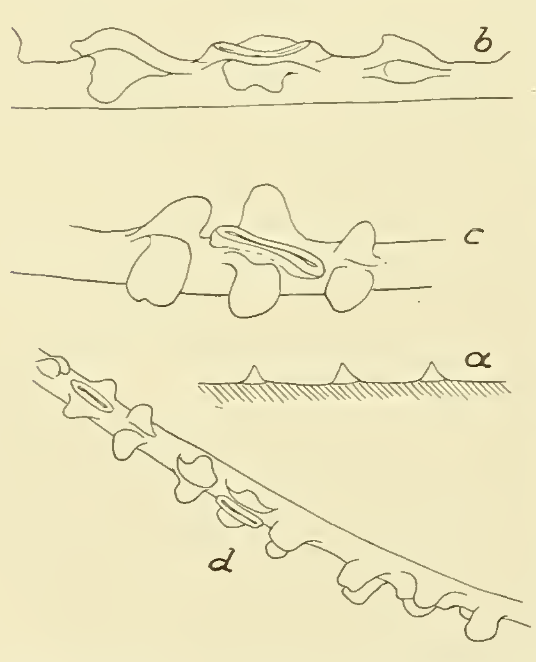

Fig. 1. *Sibopathes gephura* sp. n. *a* Spines on a branch, at the polyp-bearing side; *b*, *c*, *d* polyps; *a* 52 ×; *b* and *c* 14 ×; *d* 7.6 ×.

The spines are arranged in four longitudinal rows on the pinnulae and branches, but on the stem there are at least 6 rows visible from one aspect. The rows are nearly at the same height so that the spines form verticils, but there are also places where a slanting quincunx appears. The distance of the spines in a row is 180 μ; the length of the spines on the polyp-bearing aspect of the axis is 30—40 μ, and they are somewhat shorter at the other side. The spines are triangular, with a smooth surface (fig. 1 *a*) and a sharp apex.

Nearly on the whole colony the polyps, which are well preserved, are placed on the front aspect of the stem and the the upperside of branches and pinnulae. The tentacles are arranged in three pairs (fig. 1 *b*, *c*, *d*),

and the distance between two pairs is 0.8 mm., while the distance between the lateral pairs of two neighbouring polyps is somewhat greater (0.8—1.1 mm.) so that in most cases it is very conspicuous which pairs appertain to the same polyp (fig. 1 *d*). The tentacles are short and thick or very broad and flat; their length is at the utmost 0.55 mm.; often they are shorter and knobbier. The oral cone is proximally and distally higher than in the middle (fig. 1 *b*); the transversal axis is 0,875 mm., the sagittal axis is 0.2 mm.. The mouth itself is also very much transversally elongated (fig. 1 *c* and *d*) and the proximal and distal ends are wider, whilst in the middle the walls of the mouth are pressed together. On the stem and the older parts of the branches the polyps have quite the same structure; the tentacles of the sagittal pairs are separated by a somewhat greater distance than the tentacles of the lateral pairs, but this is also in a minor degree visible on the younger branches. Nowhere young polyps are found between the adult polyps.

This specimen is closely related to *Cladopathes* Br. and *Taxipathes* Br. However there are too many differences in the mode of branching of the colony, the mouth, the structure of the polyps and especially in anatomical structure to join this specimen to *Cladopathes* Br. The mode of branching becomes more like that of *Taxipathes*, while the to a high degree transversally elongated mouth is also to be found in *Taxipathes*. The mode of branching is on some points also like *Parantipathes* Br., but the structure of the polyps is wholly different. On ground of the many and important deviations this new genus is formed.

2nd Subfamily Heterotaeniales s. f. n.

1st Tribe **Ptuchaephora** n. n.

Bathypathes Brook (emend.)

1st Subgenus *Schizopathes* Br. (emend.)

1. *Schizopathes affinis* Br. (emend.)

Schizopathes affinis Br. Brook, Chall. Reports. Antipatharia, 1889, pg. 148, Pl. IX, figs. 1—6; F. Cooper. Antipatharia (Percy Sl. Tr. Exp.), pg. 308, Pl. 41, figs. 1, 2.
Schizopathes crassa Br. Brook, Chall. Reports. Antipatharia, 1889, pg. 147, Pl. VIII; Hickson, Journ. Mar. Biol. Ass. Vol. VIII (N. S.) pg. 6.

Stat. 214. 6° 30′ S., 121° 55′ E. Banda Sea. 2796 M. Grey and green mud. 1 spec.

The base of this specimen is free and hooked after the model drawn by Brook on his Pl. IX, fig. 5. The first 7 cm. of the stem are unbranched; the branched part is 25 cm. long. The base is hooked in the same plane as that of the branches; the rest of the unbranched part is straight or slightly curved forwards. At the beginning of the branched part there is a slight curve to the front, followed by a straight part, which in its turn is followed by a slight curve to the front; the top part of the colony is slightly curved backwards. The proportions of the diameter of the hook are the same as in Brook's figure. The greatest diameter of the broad flat side is 1.3 mm., about the place where the straight part of the basis begins. Farther on the diameter lessens gradually towards the top which ends fully 2 cm. above the last branch. The branches alternate regularly right and left; only in one single case a branch on the right

side is omitted. In both rows the number of branches is 34; the distance between two branches of the same row is about 6 mm; between the lowest branches this distance is somewhat larger: 8 mm. The angle between the branches and the stem is by the lowest pair 45 degrees. By the following pairs this angle is always 60°, but in the top-part of the colony this angle becomes somewhat more acute. The angle between the right and left branch of the first pair is fully 30° (on the front-aspect of the colony); this value very suddenly increases, so that after six pairs both rows of branches lie in the same plane. The lowest branches are straight in their proximal part while their distal part is curved backwards; along their whole course they are inclined towards the top of the colony. The higher the branches are inserted on the stem, the sooner they curve backwards, and they are inclined to the stem at a more acute angle; the top of the branches is often more highly curved.

The length of the lowest branches is 20 cm.; the 10th branch is 14 cm.; the 20th is 7.5 cm.; the last branch is 2.5 cm.. The stem is laterally compressed, just like the hook, but the plane is shifted with regard to the plane of the branches.

The broad part of the hook bears on the convex side, which is the prolongation of the frontside of the stem, two rows of small spines, clearly the remains of the longitudinal rows of spines. These rows are continued at the lower part, but at last one simple row remains on the convex side of the hook; while the spines diminish in length, this row also disappears on a little distance of the end of the hook. So BROOK's statement that the rows of spines occur on the flat side of the hook does not hold good for this specimen, which is better in accordance with the twisting round of the axis, shown by the hook. The rest of the hook-surface is smooth. On the greatest number of branches the spines occur only on the polyp-bearing side; the other aspect of the axis is totally smooth. From a lateral aspect only two rows are visible. Some branches have also spines on the not-polyp-bearing side, but only very small ones; in this case four to five longitudinal rows are visible. There is no further regularity in the distribution of the spines. The spines (fig. 2) are smooth and triangular; the longest are 40 μ; the distance between two spines is 195—300 μ.

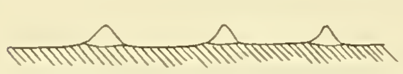

Fig. 2. *Schizopathes affinis* (Br.) em. Spines on a branch, at the polyp-bearing side; 52 ×.

The polyps, which are preserved on the whole colony, are placed at the front of the stem and the upper-frontal side of the branches. Even on the unbranched part of the stem, on the right side in which direction the hook is curved, some polyps occur. On the coenenchyma which covers the thickest part of the hook, numerous sub-parallel transversal furrows are to be seen; these are polypar borders. The polyps (fig. 3) are crowded and young polyps are to be found between the adult ones, even at the base of the largest branches. — The distance between the lateral and sagittal pairs of tentacles is 1.2—1.4 mm.; this distance is somewhat less than that between the lateral pairs of two adjoining polyps, which is 1.6 mm. or a little more. If there are young polyps present, this difference in distance is not so striking

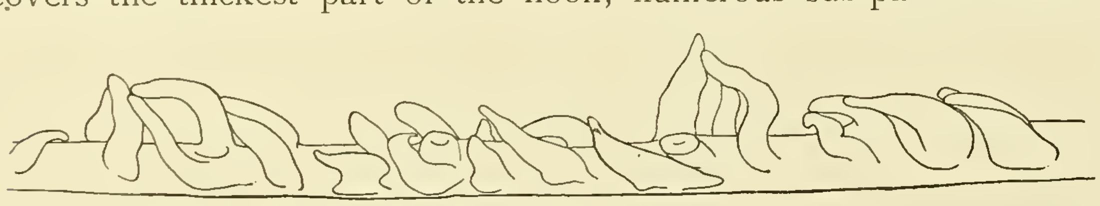

Fig. 3. *Schizopathes affinis.* (Br.) em. Three adult polyps and a young one; the oral cone of the left polyp is lost; 7.6 ×.

but otherwise it is visible with the naked eye [1]). At the top of the branches the length of all the tentacles is 1.5 mm.; on the middle of the branches this length is somewhat less, but at the base of the branch the length is again 1.5 mm.. — There is nothing to be perceived of the degeneration of polyps which Brook describes and figures at the base of the branches; the little difference in length, which occurs, may easily be explained by the influence of the preservation. Also on the unbranched part of the base of the colony the tentacles are still very long. — There is well-developed oral cone (fig. 3); the mouth is usually inconspicuous but in most cases it is rounded and small. The back part of the axis shows a longitudinal groove in the coenenchyma. This specimen can, with regard to the mode of branching, dimensions and the form of the hook, be compared with *Schizopathes affinis* Brook, but as to the spines it is more like *Schizopathes crassa* Brook. As the polyps also show little deviations, e. g. the perceptible interpolypar distance, when compared with both Brook's species, it is perhaps not undesirable to explain all the differences, which occur between Brook's species and the Siboga-specimen, as variations and to join all specimen in *Schizopathes affinis* Br., so that *Schiz. crassa* Br. disappears. The fact that only one specimen of this last species is found, makes it easier to accept this mode of dealing with it.

The specific diagnosis must be emendated as follows:

Colony. The branched part is flattened and triangular or sub-triangular; branches alternating laterally, decreasing in length towards the top of the colony. The base is hooked with flat sides and twisted at right angles to the plane of the branches.

Spines. Short, triangular, smooth, arranged in 4—5 longitudinal rows or leaving one aspect of the axis smooth; distance irregular, so that sometimes there are verticils, alternating with a wholly irregular distribution.

Polyps. Crowded, with little or no interpolypar distance; all on one aspect of the axis; sometimes degenerating on the older parts of the colony. Mouth rounded and small, on the top of a cylindrical oral cone. — Length of the tentacles 1.5 mm.

Former habitat.

Brook.	35° 39′ S.	50° 47′ W.	1900 fathoms, blue mud.
Brook.	4° 21′ S.	129° 7′ E.	1425 „ „ „
Brook.	2° 33′ S.	144° 4′ E.	1070 „ „ „
Hickson.	48° 7′ N.	8° 13′ W.	412 „
Roule.	45° 38′ N.	5° 53′ W.	1220 Meter.
F. Cooper.	45° 13′ N.	80° 56′ E.	880 fathoms.

2nd Subgenus *Eubathypathes* (Br.) n. n.

1. *Eubathypathes patula* (Br.) emend.

Bathypathes patula Br. Brook, Chall. Report. Antipatharia 1889, pg. 151, Pl. V, figs. 1—4; F. Cooper. Antipatharia (Percy Sl. Tr. Exp.), p. 310, Pl. 41, figs. 5—9.

1) Unfortunately a part of a branch, which does not show this interpolypar distance so clearly, was chosen for the fig. 3.

Bathypathes patula Br. var. *plenispina* Br. BROOK, Chall. Report. Antipatharia 1889, pg. 152, Pl. V, fig. 5; A. THOMSON, Report on the Antipatharia (Scottish Antarctic Exp.). Proc. R. Phys. Soc. Ed. 1904—1905, Vol. XVI, part I.
Bathypathes alternata Br. BROOK, Chall. Report. Antipatharia, 1889, pg. 153, Pl. IX, figs. 7—10.
Bathypathes erotema Sch. SCHULTZE, Valdivia, 1902, Bd. III, Lief. 2. Die Antipatharien der deutschen Tiefsee-Exp. 1898—1899, pg. 98, Taf. XIII, fig. 3; Taf. XIV, figs. 9 and 13.

Stat. 74. 5° 3'.5 S., 119° 0' E. Makassar Straits. 450 M. Globigerina ooze. 2 spec.
Stat. 88. 0° 34'.6 N., 119° 8'.5 E. Makassar Straits. 1301 M. Fine grey mud. 1 spec.
Stat. 119. 1° 33'.5 N., 124° 41' E. Celebes Sea. 1901 M. Stony bottom. 1 spec.
Stat. 211. 5° 40'.7 S., 120° 45'.5 E. Banda Sea. 1158 M. Coarse grey mud. 1 spec.
Stat. 214. 6° 30' S., 121° 55' E. Banda Sea. 2796 M. Grey and green mud. 2 spec.

The specimen of station 88 has a very slightly curved stem; the height is 14 cm.; the top is not intact, but apparently only a little piece was snapped off. There are eight pairs of branches, which are in the left row 1.25 mm. higher inserted than in the right row (viewing the colony from that aspect where the planes of the two rows make an acute angle). The length of the branches is (to begin with the lowest) in the right row: 6.5; 8.25; 9.5; 8.5; 6.5; (2.25); (0.75); (0.35) cm.,[1]) and in the left row: 7; 7.5; (6); (6.75); (5); (2); 7.35; 2.75 cm. The angle between the branches of one pair is for the 1st pair 45°; 2nd pair: 35°, but for the following pairs this value gradually increases to 90° by the 8th pair. All branches are curved downwards, after having a distal direction with an angle of 60° with the stem. The distance between the branches in the same row is ± 9 mm. The base of the stem is fixed to a piece of bark by an elliptical black dilation (axes: 2 and 1.5 cm.). The diameter of the base is 770 μ, by the first branch 690 μ, where a slight increase of diameter is observed, and diminuates regularly to the top (275 μ). The basal diameter of the branches is in the right row: 345 μ, 385 μ, 470 μ, 427 μ, 415 μ, 385 μ, 288 μ, 220 μ, and in the left row: 330 μ, 385 μ, 470 μ, 440 μ, 415 μ, 385 μ, 275 μ, 220 μ, and diminishes gradually towards the top of the branches.

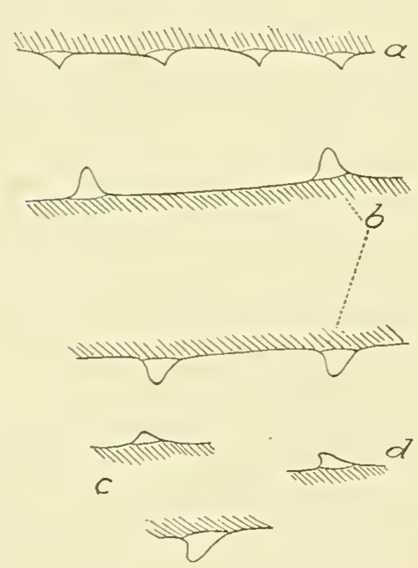

Fig. 4. *Eubathypathes patula* (Br.) em. *a* Spines on the stem; *b* spines on opposite sides of a branch; *c*, *d* spines on the top-part of a branch; *a*, *b*, *c*, *d* 52 ×.

There are no polyps on this specimen. — The base of the colony is mainly smooth and has only sporadical little knobs. Halfway the unbranched part of the stem there are already regular longitudinal rows of spines but they are very low and blunt, at the utmost: 30 μ. On the branched part of the stem the spines are also smooth and small but more acute (fig. 4 *a*); there are four longitudinal rows, so far asunder that a quincunxial arrangement is not conspicuous; the distance between the spines is (180—) 225 μ. There is no difference in length between the spines of different sides of the axis. — On the branches (fig. 4 *b*) these conditions are the same but the quincunx is better visible, although deviations occur through the varying distance of the spines. On the younger parts of the branches the spines are longer and the longest spines stand on the convex side of the branch; length

1) The numbers between brackets indicate that the branch is broken.

65 μ and 20 μ (fig. 4 *c*); the distance varies from 375—525 μ. Many branch-tops have 5 longitudinal rows with many quincunxial parts and the form of the spine is somewhat more hooked (fig. 4 *d*).

The stem of the specimen of station 211 is in its unbranched basal part curved forwards, while the branched part is curved backwards and the top again curves forwards. The unbranched part is 10.5 cm.; the branched part 8 cm. The basal dilation is rounded. The basal diameter is 550 μ which increases to 650 μ on a height of 4 cm. and remains so till the first branches, after which the diameter diminishes regularly; the top ends 7 mm. above the last branch. — The branches are long and slender; the lowest are at right angles with the stem, while the higher inserted pairs make a more acute angle with the axis. All branches are curved distally first but their tops are again curved towards the base of the colony. The angle between the first pair of branches is 22.5°, which value increases regularly for the higher pairs, to nearly 90° for the last branches. — There are 11 branches in the left row and 8 in the right row, and they do not form such regular pairs as with the specimen of station 88. The first left branch is inserted 2.5 mm. lower than the first right branch; the distance between the branches is for the left row: 6.5; 5; 7.5; 3.5; 7; 6.5; 6.25; 5.5; 6.75 mm. and for the right row: 10; 11.75; 7; 10.25; 8.5; 7; 7 mm. The length of the left branches is; 6.5; 7.25; 7.67; 8; 9; 10; 9.25; 9; 8; 6.25; 2 cm., and of the right branches: 8.5; 9; 9.25; 10; 8.5; 5.5; 3.25 cm. The branches are inserted at right angles with the stem; first they are distally curved and then they are directed towards the base of the colony: — The angle between the first pair is 90°, and this value increases swiftly up to 150° by the last pair. While these last branches are somewhat curved backwards, they lie nearly in one and the same plane.

The spines are sharp and conical; even the basal part of the stem shows the spines well-developed and nearly normally distributed; the distance in one row is here very variable, from 225—300 μ and over. The back side of the stem is almost smooth, except in the younger top-part where the number of longitudinal rows is four, with regular quincunxial arrangement, and a distance of 255 μ between the spines of a row. On the branches there are 3—4 longitudinal rows forming a slanting quincunx. The distance between the spines is 300 μ; the length of the spines on the not-polyp-bearing side as well as on the polyp-bearing side is 45 μ. The form of the spines is as fig. 4 *b* but sometimes somewhat more sharpened. The young spines at the top are very short: 10 μ. The polyps (figs. 5 and 6) are inserted on the front of the stem and on the upper-frontal side of the branches, always in one series. The unbranched part is without polyps. — The sagittal tentacles are inserted at a somewhat lower level than the lateral ones and all the tentacles are inclined distally (figs. 5 and 6); the distance between the pairs of tentacles is always 2.75 mm., but towards the top the pairs are more crowded and by the

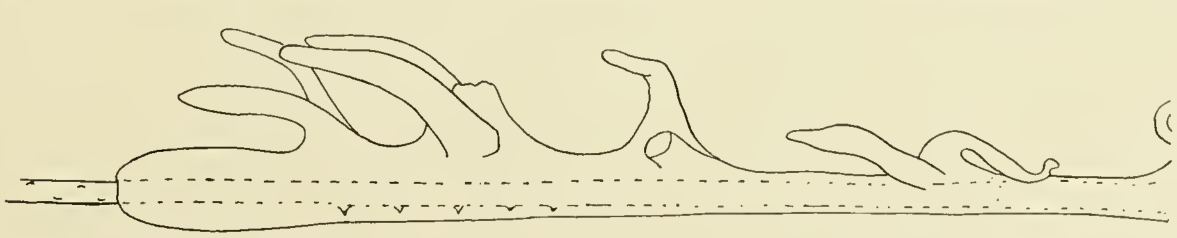

Fig. 5. *Eubathypathes patula* (Br.) em. Polyps on the end-part of a branch; the left polyp is complete, except for one lateral tentacle; the distal lateral pair of the second polyp is visible and part of the sagittal pair; 14 ×.

last polyp the distance between the sagittal pair and the distal lateral pair is 1.1 mm., between the sagittal pair and the proximal lateral pair 1.75 mm. and 2.2 mm. between the lateral pairs of this polyp and the last but one. — The length of the sagittal tentacles is 1.5 mm., and of the lateral ones 1.2 mm. — The obtuse conical oral cone (fig. 5) is 0.45 mm. in height, and its longest diameter is 0.275 mm. The mouth is irregular and shows an inclination to be elongated in a sagittal direction (fig. 6).

Fig. 6. *Eubathypathes patula* (Br.) em. Polyps of fig. 5 in oral aspect; 14 ×.

The type of the colony of the two specimens of station 214 is the same as of station 211; one of them however has a nearly straight unbranched part, so that the backward curve of the branched part is the more accentuated, which at the end is sub-horizontal. — Specimen A is without polyps; the unbranched part is 7.6 cm., the branched part is 3.3 cm. The basal diameter of 255 μ increases to 315 μ on a height of 4 cm. and continues so till the first branches, than increases still more till 330 μ in the middle of the branched part, which is followed by a regular and swift diminuation towards the broken top, which ends 1 mm. above the last branch. The basal dilation is a darkbrown, light-bordered, round, thin disk with a diameter of 2.5 mm. and with knobs, which are probably caused by the underground (a stone). — The branches are as regularly inserted as in the specimen of station 88; there are 7 pairs of branches the length of which is in the right row: 3.3; 3.95; 4.85; (2.7); 5.8; 4.35; (2.25) cm. and in the left row: 2.8; 3.5; 4.55; 3.35; (1.6); (1); (0.45) cm. The distance in the same row is ± 5 mm., and the basal diameter of the branches is in the right row: 245 μ; 240 μ; 240 μ; 232.5 μ; 232.5 μ; 180 μ; 150 μ; and in the left row: 240 μ; 247.5 μ; 225 μ; 210 μ; 225 μ; 172.5 μ; 142.5 μ.

At the base of the colony there are only scattered spines; some of them are fused together to a sort of longitudinal ridges (fig. 7 *a*), which sometimes extend over a long distance and wind round the axis in a very steep spiral. At a height of 2.5 cm. begins an absolutely smooth part and only quite near the branches, on one of the lateral sides of the stem a few low spines appear with a distance of ± 375 μ and a length of 30 μ; there are only two or three rows, often incomplete. On the branched part the spines are regularly distributed; on the left side of the axis they are longer than at the right side; the form of the spines is as in fig. 7 *c*; the distance in a row is 300 μ; the number of longitudinal rows is five without any quincunxial regularity. On the higher parts of the stem the spines are still low; often they disappear totally but at the top-part they are more distinct (fig. 7 *b*). On the branches there are four longitudinal rows, sometimes forming verticils but usually they soon disappear, as the distances in a row are very variable: 285—375 μ. The length of the spines is 50 μ and 30 μ (fig. 7 *c*); the longest are placed on the convex side of the axis therefore

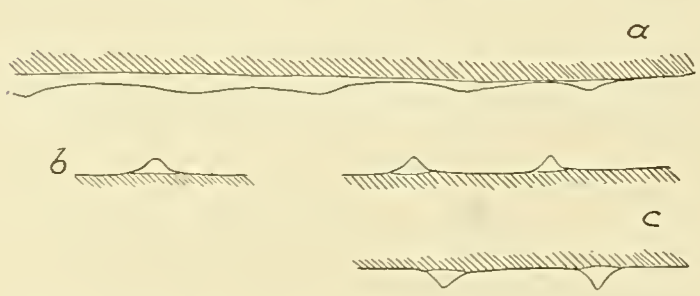

Fig. 7. *Eubathypathes patula* (Br.) em. *a* Fused spines at the base of the colony; *b* spines on the top of the colony; *c* spines on a branch; *a*, *b*, *c* 52 ×.

on the upperside of the branch. All the spines are smooth. The spines at the top of the branches have the form of fig. 4*d*.

The second specimen of the same station, without base, has an unbranched part of 5.75 cm. and a branched part of 4.5 cm., which at its top-part is again curved forwards. — The basal diameter is 105 μ, which increases to 300 μ at the beginning of the branched part and afterwards to 315 μ between the two first pairs of branches, to diminuate first slowly, than swiftly at the top. All the right branches (six and a little stump) are inserted 1.25 mm. higher than the left branches (seven). Their length is in the right row: (2.45); 3.7; 4.6; 5.2; 4.8; 3.3 cm., and in the left row: 3.6; 4,2; 5; 5.5; 4.7; 3.8; 2 cm.; the distance between the branches in a row is for the right row: 7; 6.3; 6.3; 6.75; 5.3; 6 mm., and for the left row: 7.5; 6.5; 6.6; 6.6; 5.3; 6.25 mm. The angle between the branches of the lowest pair is 52.5°, increasing regularly to 150° by the highest pair, which is curved backwards and so lies in the same plane. The angle between branches and stem is 65°, which increases slightly towards the upper branches. On their further course they are curved towards the base of the colony. The base of the colony is wholly smooth; on a height of 3 cm. little spines put in appearance at the front of the stem, with a length of 20 μ, and a distance of 345 μ. — A short distance below the first branch the spines occur at all sides of the stem; there is no regularity except in four longitudinal rows. At the front of the axis the spines are slightly longer (30 μ) than on the other side; the form is as in fig. 7*c*. On the branches the spines (fig. 8*a*) are longer on the polypbearing side (30 μ, and 15 μ on the other side). Their distance varies to a high degree round 345 μ; there are four longitudinal rows.

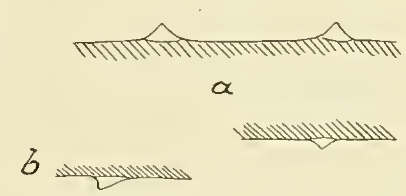

Fig. 8. *Eubathypathes patula* (Br.) em. *a* Spines on a branch; *b* spine on the top of a branch; *a*, *b* 52 ×.

The polyps cover the stem and the branches except the unbranched part; they are placed on the front of the axis, somewhat directed upwards. The distance between the pairs of tentacles in the same polyp is the same as between two polyps: 2.2 mm. The tentacles are very long (max. 2.7 mm.) thin and transparent. The oral cone is well developed and has the form of a stunted cone. At some places the tentacles are not so long.

The specimen of station 119 is without polyps. The form of the colony is the same as for the specimen of station 211. The unbranched part is 7.6 cm., and the branched part 3 cm. Just above the middle of the unbranched part the stem forms an obtuse angle. The basal plate is elliptical (2.2 × 1.6 mm.) fixed to a calcareous needle; the dark centre (1 mm. diameter) is sharply separated from the lighter border. The basal diameter of the stem of 135 μ increases after 4 cm. to 255 μ, to diminuate afterwards; the top ends 8 mm. above the last branch. — The three right branches are long 3.1; 3.15; 0.25 cm. and the four left ones: 3.5; (1.35); 2.3; 0.7 cm. The distance is in the left row: 9; 6.25; 4.5 mm. and in the right row: 7:5; 12.5 mm. The angle between the branches of the first pair is 45°, of the second pair 90°. The angle between branch and stem is 70° by the first pair; 75°—80° by the following pairs. The lower branches are curved first distally and then outwards; the higher branches are first straight, then curved towards the base of the colony. The spines are already present at the base of the colony and of the type fig. 7*b* and *c*, with a varying distance of 225—

375 μ. There are three longitudinal rows without further regularity. The longest spines (35 μ) are to be found at the front of the axis. Higher at the axis again long ridges occur, on which the spines are as distinct as on the other parts of the axis. On the branched part of the stem there are 4—5 longitudinal rows and the type of spines is as in fig. 7 *c*. — On the branches the long spines (45 μ) are formed as in fig. 4 *b* and the short ones (30 μ) as in fig. 7 *c*. Their distance varies from 225—300 μ; there are four longitudinal rows, without further regularity. On the distal part of the branches the bases of the spines are very much elongated, as a beginning of ridge-forming (fig. 9 *a*). Also the spines are distally inclined. The spines remain free from one another. The longest spines are inserted on the upper-frontal side of the branches. — At the top-part of the branch the very great width of the axis lumen and its very thin wall is striking (fig. 9 *b*).

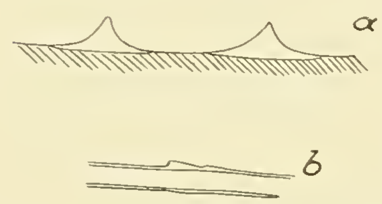

Fig. 9. *Eubathypathes patula* (Br.) em. *a* Spines with elongated base, on the distal part of a branch; *b* top part of a branch; *a* 52 ×.

Both specimen of station 74 show the same curves of the stem as the specimen of station 211. One is without polyps and without the natural base. The unbranched part is 3.5 cm. the branched part 2.5 cm. The basal diameter of 220 μ diminues gradually towards the top which ends 2.5 mm. above the last branch. There are 5 left and 4 right branches. Their length is in the right row: 3.5; 4; 2.9; 2.2 cm., and in the left row 3; 1.8; 1.5; 2.4 cm. — The distance in a row is regularly 5.5 mm. All the right branches are inserted 0.75 mm. above the left branches. The angle between branch and stem is ± 60°; the angle between the branches of the first pair is 67.5°, but with the second pair already 105°; this value increases with the following pairs to 120°.

On the unbranched stem there are four longitudinal rows of spines, with a distance between the spines of 225—375 μ and no other regularity. The form is as fig. 7 *b* but on the branches the spines are more acute (fig. 4 *a*). The length of the spines (25 μ) is subequal on opposite sides of the axis.

The other specimen of this station has polyps and a basal plate fixed on a branch, dark-brown, gradually lighter towards the border, round (1 cm. diameter). The unbranched part is 10.5 cm. the branched part is 4.5 cm. The basal diameter is 300 μ, increases to 385 μ after 2.5 cm., and gradually diminues towards the top, 0.5 cm. above the last branch. All right branches are inserted regularly 1 mm. above the left branches. The distance in a row is 5.5 mm., increasing slightly by the middle branches. The length of the branches is in the right row: 4.6; 5.3; 5.8; 5.9; 5.5; 4.7; 1.5; 0.7 cm., in the left row: 4.8; 5.3; 5.7; 6.4; 5.9; 5.1; 3; 1.1 cm. — The angle between the first pair is 45°; between the second pair: 90°; this value increases to 120° by the last pair, where the branches are curved backwards till they lie in a plane. — The angle between branches and stem is always 60°. The first pair is directed distally and the tops curve together; the other branches are curved first distally and forwards and then towards the base and backwards; this last curve is stronger as the branch is higher inserted.

The base of the stem has a few scattered spines, but a little higher the stem is totally smooth: only it is covered by grooves and folds in steep spirals. A short distance before the branched part the spines appear in 4 (—5) longitudinal rows; their distance in a row is 300—525 μ; the type is as fig. 8 *a*, somewhat longer on the front of the axis. On the branches are 4 rows

STATION OR SPECIES	type of the colony	diameter of the stem	angle between branches and stem	angle between the pairs of branches	distance between the pairs of tentacles	length of tentacles	length of spines	number of rows	further regularity in spine-distribution	distance of spines in a row	relative place of the branches	number of the branch, which has the greatest length
I. 88	very slightly curved in form of point of interrogation	diminues regularly from the base	60°	1st pair: 45° 2nd pair: 35° further increasing to 90°	?	?	30 μ (top: 65 μ & 20 μ	4	sometimes quincunx	375—525 μ	in regular pairs	left row: 3d right row: 3d
II. 211	distinct form of point of interrogation	increases; diminues after 4 cm. (on the unbranched part)	nearly 90° (more acute in higher part)	1st pair: 22.5° further increasing to 90°	2.75 mm.	sag. 1.5 mm. lat. 1.2 mm.	45 μ	3—4	slanting quincunx	300 μ	irregular	l. r.: 6th r. r.: 4th
III α. 214	distinct form of point of interrogation	increases; diminues on the middle of the branched part	nearly 90°	1st pair: 90° further increasing to 150°	?	?	50 μ & 30 μ	4 (stem: 5; base: ridge)	none (sometimes verticils)	285—375 μ	regular pairs	l. r.: 3d r. r.: 5th (or 4th)
III β. 214	distinct form of point of interrogation	increases; diminues on the middle of the branched part	65° (increases in higher part)	1st pair: 52.5° further increasing to 150°	2.2 mm.	2.7 mm. (sometimes less)	30 μ & 15 μ	4	none	highly variable round 345 μ	regular pairs	l. r.: 4th r. r.: 4th
IV. 119	distinct form of point of interrogation	like II	1st pair: 70° other pairs: 75°—80°	1st pair: 45° 2nd pair: over 90°	?	?	45 μ & 30 μ	4 (stem: 3; top: ridge)	none	225—300 μ	irregular	l. r.: 1st r. r.: 2nd
V α. 74	distinct form of point of interrogation	like I	60°	1st pair: 67.5° 2nd pair: 105° further increasing to 120°	?	?	25 μ	4	none	225—375 μ	regular pairs	l. r.: 1th r. r.: 2nd
V β. 74	distinct form of point of interrogation	like II (diminues after 2.5 cm.)	60°	1st pair: 45° 2nd pair: 90° further increasing to 120°	over 2 mm.	1.5—2.5 mm.	30 μ & 15 μ	4	none	225—300 μ	regular pairs	l. r.: 4th r. r.: 4th
B. patula Br.	slightly curved	like III	nearly 90°	obtuse angle	3 mm.	± 1.5 mm.	± 60 μ	5 (top: ridge)	irregular right spirals	± 600—675 μ	regular pairs	l. r.: 5th or 6th r. r.: 5th or 6th
B. patula Br. var. *plenispina* Br.	slightly curved	like III	nearly 90°	1st pair: acute 2nd pair: over 90° 3d pair: wide obtuse angle	?	?	± 75 μ	4	irregular right spirals	250—375 μ	regular pairs	l. r.: 7th [1]) r. r.: 7th
B. alternata Br.	slightly curved	?	60° (diminues to 45° in higher part)	nearly 180°	± 2.5 mm.	± 2.5 mm	± 60 μ	4	none (sometimes verticils)	150—375 μ	alternating regularly	l. r.: 1th r. r.: 1th
B. tenuis Br.	slightly curved	?	45°	(nearly 180°) [2])	?	?	40 μ (?)	(stem: 3) irregular	none	150—375 μ	alternating regularly	l. r.: 1th r. r.: 1th
B. erotema Sch.	distinct form of point of interrogation	like I	60°(—90°?)	1th pair: 60° increases to ± 180°	± 2.3 mm. [3])	2.5 mm.	60 μ & 34 μ	4	none	300—1000 μ	regular pairs	l. r: 3d r. r.: 3d

1) Specimen, described by THOMSON. 2) Not explicitly given by BROOK. 3) This value is not deduced from the diagnosis but from the description.

of spines of the same type; length 30 μ on the upper-frontal side of the axis and 15 μ on the other side; distance 225—300 μ.

The badly preserved polyps are placed on the front of the branched part of the stem and the upper-frontal side of the branches. The tentacles are transparent, thin and long: 1.5—2 mm. Sometimes they attain a length of 2.5 mm. but on the older parts also shorter tentacles occur. The distance between the pairs of tentacles is fully 2 mm.

In the table (pg. 35) I have shortly mentioned the characteristics of the "Siboga"-specimens and of the other known species, wherefrom *Bathypathes lyra* Brook is excepted, just as *Bathypathes bifida* Thomson, since the mode of branching of both species, especially with the latter one, is of a sufficiently clear specific character. I have included *Bathypathes tenuis* Brook in the list, to demonstrate how the characteristics of this species also melt imperceptibly into those of the other species, so that only the few remnants of secundary branches of *Bathypathes tenuis* are the reason why this species has been left intact; for I have no reason whatever to suppose that secundary branches occasionally occur in the species the branches of which are simple. The data of the species described by Brook are derived from his descriptions and from the figures, in so far as it was possible. Grouping the specimens and species according to the different characteristics, we get the following groups:

In type of colony belong together: I, II, III α and β, IV, V α and β, *B. erotema* in one group, and *B. patula, B. patula* var. *plenisp.*, *B. tenuis* and *B. alternata* in a second group.

In diameter of the stem belong together: I, V α, *B. erotema* (and perhaps *B. alternata* and *tenuis*) in one group; II, IV, V β in a second group, and III α and β, *B. patula* and its var. *pl.* in a third group.

In angle between branch and stem belong together: I, III β, V α and β in one group; II, III α, *B. patula* and its var. *plenisp.* in a second group while the other three are each different from one another and from both groups, however without a very sharp distinctive.

In angle between the pairs of branches there are three groups: I, II and IV in the first one; III α and β, V α and β, *B. erotema* and *B. patula* var. *plenisp.* in the second one, and *B. patula*, *alternata* and *tenuis* in the third one.

In distance of the pairs of tentacles II and *B. patula* form one group, and III β, V β, *B. erotema* and *B. alternata* a second group.

In length of tentacles II and *B. patula* form one group, III β, *B. alternata* and *B. erotema* a second group while V β holds the middle between both groups.

In length of the spines belong together: I, II, III α, IV, *B. tenuis* and *B. erotema* in one group; III β, V α and β in a second group and *B. patula*, its var. *plenisp.* and *B. alternata* in a third group, which has transitions to the first group.

In number of longitudinal rows I, II, III β, IV, V α and β, *B. erotema*, *B. patula* var. *pl.* and *B. alternata* form a group, and the other three are each slightly different from this group and each other.

In the further regularity in spines-distribution I, II, *B. patula* and its var. *pl.* form a group, which by III α and *B. alternata* is connected with the third group of III β, IV, V α and β, *B. tenuis* and *B. erotema*.

In distance of the spines *B. patula* and *B. erotema* together form a group, and all other ones a second group.

In relative position of the branches the case is the same for II and IV, while all the others form the other group.

In number of the longest branch there are three groups: IV, V α, *B. alternata* and *B. tenuis* form one group; I, III α, *B. erotema* a second one, and II, III β, V β and *B. patula* a third one, while *B. patula* var. *plenisp.* is different from all three groups.

In many cases this groups are connected by transitions. By studying this data it is clear that the boundaries between these species are not sufficiently circumscribed to justify their creation. Again and again the "Siboga"-specimens produce the desired transitions and the mixture of characteristics of different species. Brook himself has often remarked in his species-descriptions how much these species are like *Bathypathes patula* Brook and differ from it only in minor characteristics, differences, which are made even more insignificant by the "Siboga"-specimens.— Only *Bath. lyra* Br. and *Bath. tenuis* Br. are easily distinguishable. Schultze's *Bath. erotema* is, as he himself remarks, very much like *Bath. patula* Br., and they differ only in the dimensions of the polyps and the distribution of the spines, which differences are annihilated by various "Siboga"-specimens. Far from multiplying the number of species, difficult to distinguish from one another, which would have been easy enough, I prefer to consider the "Siboga"-specimens as local varieties of one and the same species *Eubathypathes patula*, whereto I reckon all other former species, except *Eubathypathes lyra* Br., *Eubatypathes tenuis* Br. and *Eubathypathes bifida* Thomson, and the specific diagnosis of which is as follows:

Colony: stem curved in more or less distinct form of a point of interrogation; curved branches in two rows, alternating in somewhat shifted pairs or irregularly; angle between the branches of one pair acute to nearly 180°. No secondary branches.

Spines: triangular. Oft different length on opposite sides of the axis; (3—) 4 (—5) longitudinal rows. Distance very variable around 300 μ. Smooth. Length max. 75 μ.

Polyps: distance between the pairs of tentacles ± 2.5 mm.; tentacle-length 1.5—2.5 mm.; stunted oral cone.

Former habitat.

Brook. 35° 22′ N., 169° 53′ E. 2900 fath. red clay
36° 10′ N., 178° 0′ E. 2050 fath. Globig. ooze
4° 21′ S., 129° 7′ E. 1425 fath. blue mud
2° 33′ S., 144° 4′ E. 1070 fath. blue mud.

Schultze. 63° 16′.5 S., 57° 51′ E. 4636 M. blue mud.

Forster Cooper. 6° 31 N., 79° 38′ E., 401 fm.; 11° 26′ N., 92° 53′ E., 378 fm.; 15° 29′ N., 72° 41′ E., 559 fm.

A. Thomson. Cod Bank.

2. *Eubathypathes quadribrachiata* sp. n.

Stat. 122. 1° 58'.5 N. 125° 0'.5 E. Banda Sea. 1264—1165 M. Stony bottom. 1 spec.

This colony, in possession of a basal plate, is only 2.8 cm. in height. The unbranched part of the stem is 0.5 cm. and is slightly inclined forwards, while the branched part is inclined somewhat backwards. There are nine branches to the right and nine to the left, alternating regularly right and left; the distance in the same row is 2.9 mm. The length of the branches is in the left row: 6; 17; 8; 18; 14; 10; 6; 3 mm., and in the right row: 8; 29; 22; 20; 14; 13; 11; 7 mm. All branches are tolerably sound; the extremities are exceedingly long and slender. The angle between the right and left branches is nearly 180°; the branches are lying nearly in the same plane and are curved slightly forwards and upwards. They are inserted on the stem at an angle of nearly 90° by the lowest branches, but this value diminues to 45° by the highest branches. — Beside these large branches there are also two rows of smaller ones, inserted on the front of the stem, 5 to the right and 7 to the left; the angle between these rows is only ± 25°. The plane which divides this angle is the same as the plane which divides the angle between the larger rows (fig. 10*a*). — Their length is ± 5 mm., which by the middle ones increases to 10 mm. They are inserted on the stem under the same angle as the larger branches at the same level. Their mutual distance is the same as by the larger branches; the left row is inserted everywhere 0.5 mm. below the left row of larger branches, and the same holds good for both right rows so that the mode of branching is extremely regular (fig. 10*b*).

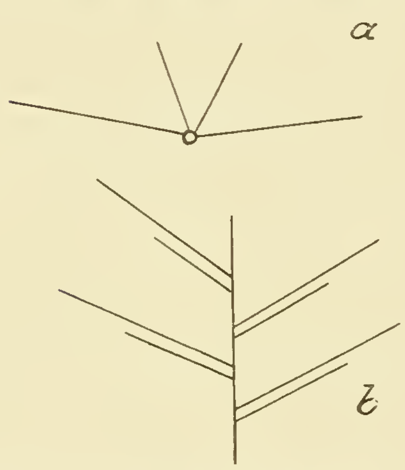

Fig. 10. *Eubathypathes quadribrachiata* sp. n. Projection of the branches on a horizontal plane (*a*), and on a vertical plane (*b*).

The basal diameter is 150 μ which increases to 255 μ, to diminue regularly shortly before the first branches towards the top (75 μ) which is broken 2.5 mm. above the last branch. The larger branches have a basal diameter of ± 135 μ (somewhat less by the higher ones) and their top is very thin; e. g. at a distance of 2.5 mm. from the top, its diameter is only 75 μ. — The small branches are much thinner.

The base of the stem has short thick spines in three longitudinal rows, with a distance of 225—300 μ in a row. Any other regularity is absent; sometimes a soon distorted and disappearing quincunx is shown. The thickest part of the stem is pretty well smooth, while the branched part has again well developed spines, 20 μ long (fig. 11). On the branches the spines are more obtuse; the longest ones (30 μ) are on the upper side of the branch; the shortest ones on the other side are 15 μ. Their mutual distance is 150—180 μ and a slanting quincunx sometimes appears. The spines are wholly smooth and never form ridges. The polyps are inserted on the upper side of the branches and on the front of the branched part of the stem. Notwithstanding the bad state of preservation the *Eubathypathes*-character is with a few polyps recognizable. The tentacles are very broad and short; their length is 225—300 μ. The distance between the pairs of tentacles is always the same (675 μ). It is impossible to see further details.

Fig. 11. *Eubathypathes quadribrachiata* sp. n. Spines on the branched part of the colony-stem; 52 ×.

First I was inclined to put this specimen by *Eubathypathes lyra* Brook, but on the following grounds this was difficult to do: by *Eub. lyra* the two first branches are inserted on the same level, which fact is explicitly mentioned by Brook by all (2) found specimens ("a feature, which otherwise might have been considered accidental"); the short branches are not more than a large sort of spines, many times shorter than the large branches; the short branches are not inserted in two rows but irregularly; they are at right angles with the stem; the distance between the pairs of tentacles is 3 mm.; there are 4 or 5 longitudinal rows of spines with irregular spiral arrangement. These differences are too many and too great than that it would not be advisable to form a new species for the time being, which species, as I add explicitly, is very nearly related to *Eubathypathes lyra* Brook and which possibly by means of transitive forms eventually to be found may be joined to it.

Perhaps *Eubathypathes quadribrachiata* sp. n., *Eubathypathes lyra* Br. and *Eubathypathes* (?) *heterorhodzos* (F. Cooper) n. n. may be considered as transitions of this genus towards *Parantipathes*.

Diagnosis:

Colony: Stem with increasing diameter and curved. Very regularly branched (see fig. 10). Two rows of large branches nearly in one plane, and two rows of smaller branches, the planes of which are at an acute angle.

Spines: triangular, smooth; distance 150—300 μ; length max. 30 μ. — Three longitudinal rows, with occasional quincunx.

Polyps: Distance between the pairs of tentacles 675 μ; tentacles broad and short (225—300 μ).

Antipathes (Pall.) emend.

1st Subgenus *Euantipathes* n. n.

1. *Euantipathes abies* (Gray) n. n.

[*Antipathes*] *abies* (Linn.) Gray. Brook, Antipatharia, Chall. Reports, 1889, p. 170, Pl. XI, fig. 21. [1]) — Thomson & Simpson, On the Antipatharia. — Cooper, Antipatharia (Percy Sl. Tr. Exp.), p. 313, fig. 9.

Var. *paniculata* Esper. Brook, Antipatharia, Chall. Reports, p. 171 — Cooper, Antipatharia (Percy Sl. Tr. Exp.), p. 313, fig. 9*a*.

Stat. 71. Makassar. 32 M. Sand with mud. 1 spec.
Stat. 305. Solor Strait. 113 M. Stony bottom. 1 spec.
Stat. 310. $8^\circ 30'$ S., $119^\circ 7'.5$ E. Sapeh Strait. 73 M. Sand with dead coral. 1 spec.

The height of the colony of station 310 is 14 cm.; its base is complete. The unbranched part of the stem is 6.5 cm. long; first it is straight, then curved and in the end straight again. At the beginning of the curved part a remnant of a branch is inserted, which, as it is a prolongation of the straight part of the base, can be taken as the principal axis. In this case the colony is a large branch, which in the following description we will persist in calling: stem.

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1) For list of synonyms, see Brook, p. 170.

Its unbranched part has remains of snapped off, rather thick branches on various levels. However the first branches which persist are only small and only some cm. higher the crown acquires its greatest compass with a diameter of 4 cm, diminishing regularly towards the top The entire branched part has an oval form, with the pointed end directed upwards. Since all the branches have a rather great basal diameter and are rather short, they have a spiny effect the ultimate branches have, at a distance of 0.6 mm. from the top, an axis-diameter of 150 μ. — The branches are inserted on all sides of the stem but always either at right angles with the stem, or directed distally at an acute angle which differs immaterially from 90°. All branches, except on their base for a space of nearly 1 cm., bear secondary branches especially the larger ones. The length of the primary branches is max. 2 cm; between the branches of a special length there are few or none smaller than their neighbours. The secondary branches are inserted somewhat laterally, in most cases on the upper-side of the primary ones, under an angle of 45° directed towards the end of the primary branch. — There are also tertiary and often even quarterly branches. The length of these branches does not regularly diminish distally but generally there is a decreasing length to be seen, approaching the end of the branches. — The branches of all these kinds are somewhat inclined downward and only seldom exceptions occur; besides there is to be seen a rotation of the branches in a negative direction, as viewed from the top of the colony. — The mutual distance of the branches is at the utmost 1 cm.; the branches of the highest order have a length of only a few mm. and have a spiny type.

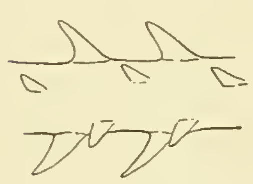

Fig. 12. *Euantipathes abies* (Gray) n. n. Spines on the distal part of a branch; 52 ×.

At the top of the branches the spines (fig. 12) are arranged in five longitudinal rows, which regularly quincunxially alternate. The mutual distance in a row is 180 μ. The spines are wholly smooth and are inclined distally; their distal side is concave, their proximal side is convex; the top is acute. The length at opposite sides of the axis is subequal (120 μ and 100 μ); the spines perforate the coenenchyma but not the polyps (fig. 13). Further from the top the longitudinal rows are visible over a little distance, in increasing number, but at last this regularity disappears and all the spines are placed pell-mell in a very great number. Their form remains the same but their length diminishes a little. These conditions are the same on the unbranched part of the stem. The entire colony is covered with polyps, except on the unbranched stem, which is covered by a parasitical growth. The colour of the polyps is greyish wine-red, which colour occurs in red spots on the tentacles and the bodywall (fig. 14). The lower branches are darker violet than the higher ones. The well preserved polyps are inserted on those sides of the branches and branchlets, which are turned towards the outside of the colony. Only on the branches of higher order the polyps are arranged in a single series; on the thicker branches, and even sometimes on the branches of

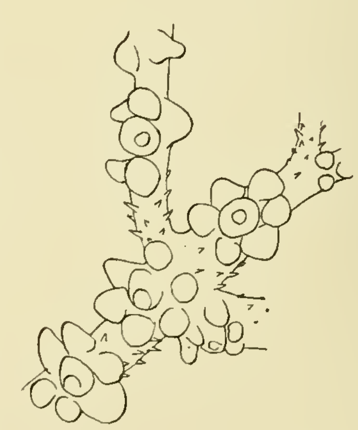

Fig. 13. *Euantipathes abies* (Gray) n. n. Polyps on the ultimate branches; 15.75 ×.

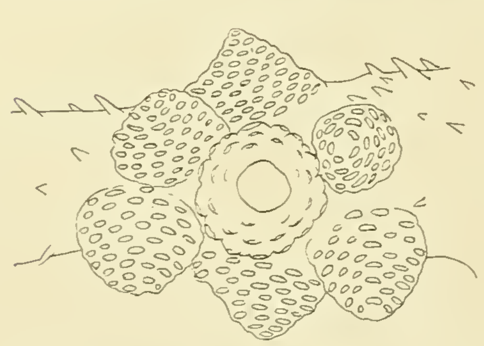

Fig. 14. *Euantipathes abies* (Gray) n. n. Polyp; 52 ×.

higher order the polyps are arranged irregularly but still principally at the outside of the branches. The tentacles are round knobs, covered with little warts, the tops of which bear a sharply defined red spot; these warts are arranged in regular, alternating verticils round the tentacles and the oral cone; each wart bears in its top a nematocyst-battery. The sagittal tentacles are inserted at a lower level than the lateral ones. Oral cone and mouth are both rounded. — The basal diameter of the sagittal tentacles is 270 μ, of the lateral ones 225 μ; they are conical in shape and their base is sometimes constricted; their length is 180 μ. The diameter of the oral cone is 240 μ and of the mouth 75 μ. — On thicker branches the tentacles are radially inserted. The interpolypar distance is $\pm$ 0.75 mm. — The polyps on the stem have their sagittal tentacles at a slightly greater distance from the oral cone than the lateral ones, but the difference is very slight. On the stem all the numerous spines perforate the coenenchyma; since for this reason the polyp-boundaries are not always clear, the colony gets an *Aphanipathes*-type, as Brook understood it; a branch, not covered by polyps, makes through the rather long spines the same *Aphanipathes*-effect.

The specimen of station 305 is only the crown of a colony, with a length of 8 cm. The only deviations, which this specimen shows, are the following: a plane of symmetry may be brought through the stem; all branches curve towards this plane, so that, viewed from the top of the colony, half of the number of branches shows a negative rotation and the other half a positive one. The length of the branches is not the same on all sides of the stem; the longest ones are 3.5 cm. The entire colony is yellowish and the polyps are milkwhite, without coloured spots. The form of the spines is somewhat longer and blunter. — For the rest the mode of branching, the polyps and the spines are the same as in the other specimen and there is not much reason to consider this specimen as a variety apart.

The fine specimen from Makassar, collected by Kraay, was dried, without traces of polyps. The height of the colony is 35 cm.; it is almond-shaped, oval in cross section, with a long axis of 17 cm. and a short axis of 10 cm. The branches are branched from their base; they are curved upwards and besides partly to the right, partly to the left from the plane through the short axis of the colony. — The principal stem is on a height of 15 cm. forked in two branches, which are a continuation of the stem, but one of which is twice as long as the other. The spines (fig. 14*a*) are rather sharp, distally inclined, with a concave distal side and a convex proximal side. Their surface is nearly smooth; only at the top (except at the ultimate point) fine striations may be observed. They are arranged in 6 regular longitudinal rows, alternating in a regular straight quincunx. — Their mutual distance is 180—200 μ, while their length is 175 μ and 137 μ on opposite sides of the axis; the shorter spines are more distally inclined than the long ones.

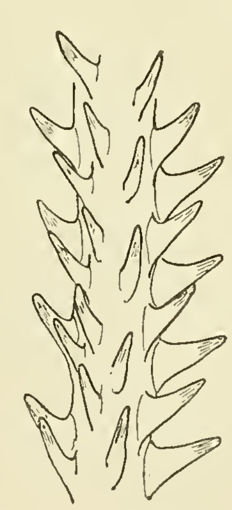

Fig. 14*a*. *Enantipathes abies* (Gray) n. n. Spines; 52 ×.

The older descriptions of the mode of branching and the form of the spines differ only in minor points of the Siboga-specimens. As the var. *paniculata* Esper obviously only slightly differs from *Antipathes abies* Gray, viz. „in having longer and more lax branches, the basal portions of which are usually devoid of branchlets" and in this latter point is like the Siboga-specimens, we can

consider these specimens as transitions between the species and its variety, so that both might be united. The polyps, described above, make it not doubtful as to which genus this formerly questionable species appertains.

The specific diagnosis is as follows:

COLONY: Branches on all sides; crown is a rotation-ellipsoid; branches are curved dextrorsally or sinistrorsally, and besides in most cases curved downwards. On their convex side are inserted secondary branches, which are branched themselves.

SPINES: At least five longitudinal rows and quincunx; irregular on the older parts. Distance 180 μ. Length $\pm$ 120 μ. Smooth. Inclined distally.

POLYPS: Knob-shaped tentacles, 180 μ long, radiate; oral cone is a half-globe; mouth is rounded. Interpolypar distance 0.75 mm.

Former habitat.

PALLAS, Indic;

ESPER, Banda-sea, etc.;

GRAY, Philippines;

BROOK (Br. Mus.), Mauritius 70 fath.; Ceylon (Ondaatje);

THOMSON & SIMPSON, Ceylon;

F. COOPER, Seychelles 37—44 fm., Amirantes 20—39 fm., Cargados Carajos 45 fm., Table Island, Andamans 15—35 fm.

2. *Euantipathes myriophylla* (Pall.) n. n.

[*Antipathes*] *myriophylla* Pall., BROOK, Antipatharia. Chall. Rep. p. 166, Pl. XII, fig. 1.
Antipathes myriophylla Pall., PALLAS, Elenchus Zooph. p. 210; ESPER, pt. II, p. 180; DANA, Zooph. p. 578; GRAY, Proc. Zool. Soc. London 1857, p. 292; POURTALÈS, Bull. Mus. Comp. Zoöl. 1880, pl III, fig. 23; COOPER, Antip. (Percy Sl. Tr. Exp.) p. 318 figs 16, 16*a*.
Antipathes myriophilla, MILNE-EDWARDS, Coralliaires, t. 1, p. 316.
Antipathes sealarki F. Cooper, COOPER, Antipatharia (Percy Sl. Tr. Exp.), p. 316, figs 13, 13*a*, 13*b*.

Stat. 100. 6° 11′ N., 120° 37′.5 E. 450 M. Dead coral. 1 spec.
Stat. 117. 1° 0′.5 S., 122° 56′ E. 80 M. Sand and coral. 1 spec.
Stat. 250. Island Kur. 1 spec.
Stat. 257. Du-roa-strait. Till 52 M. Coral. 1 spec.
Stat. 305. Solor Strait. 113 M. Stony bottom. 2 spec.

Although the base is not complete, the horizontal splinters at the base of the stem demonstrate that the specimen of station 257 was torn off from the basal plate itself. All the branches of the 17 cm. high colony lie approximately in one and the same plane; the stem is slightly curved backwards and repeatedly bent at right angles alternately to the right and to the left; at every bend a thinner branch forms a continuation of the stem. It makes an impression as if every time a branch had taken upon itself the function of the stem. The basal stem-diameter of 2.5 mm. diminishes but slightly. Only after the bends the diameter diminishes each time, finally to taper gradually towards the top. The branches are inserted at

irregular intervals; principally there are two rows, almost in one plane although the bases of the branches are not inserted accurately laterally but antero-laterally on the stem. Their length is very variable, but the shorter ones sit in the lower part of the colony. All branches are inserted at right angles with the stem or somewhat distally inclined. — The secondary branches almost lie (in a not very limited sense) in the principal plane of the colony, although they are inserted again antero-laterally, at right angles or distally inclined. Their mutual distance varies from a few mm. to 1 cm. There are also branches of the third and the fourth order. The branches of the second order have a variable length of max. 2 cm., those of the third order up to 1 cm., those of the fourth order up to 3 mm. — On the front of the colony the stem and the branches also bear some branchlets which are directed forwards and which are as long as branches of the fourth order. The branches of higher order are spine-shaped through a swift diminishing of their diameter.

The spines (fig. 15) are arranged in 5 (—6) longitudinal rows, which alternate in a quincunx. The length of the spines is 165 μ and 120 μ on opposite sides of the axis, and their mutual distance is 270 μ. Their surface is almost smooth or finely granulated by a few scattered little knobs. On the stem the spines are inserted irregularly in a very great number. They perforate everywhere the rather thick coenenchyma (figs. 15 *b* and 16); in sporadic places they also perforate the polyps (fig. 16: the sagittal tentacle of the polyp on the middle of the horizontal branch). The spines are distally inclined and their base is long and laterally compressed.

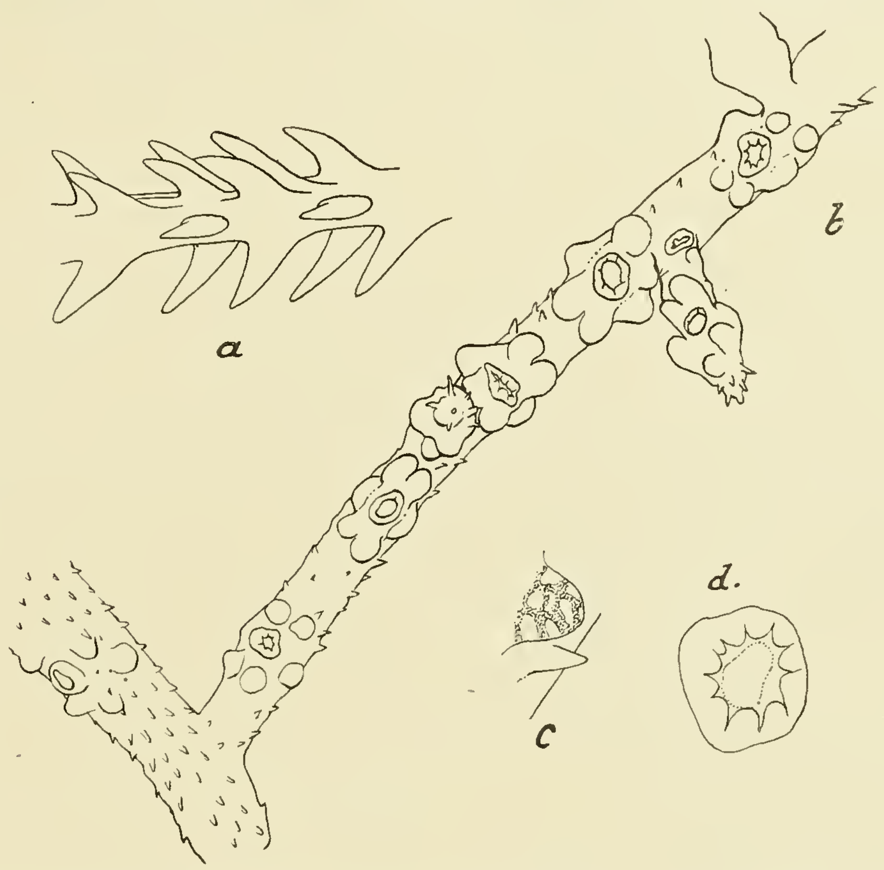

Fig. 15. *Euantipathes myriophylla* (Pall.) n. n. *a* Spines on ultimate branch; *b* polyps; the first pinnula, between the 2nd and 3rd polyp is seen end on; *c* spots on a tentacle; *d* oral cone in oral aspect; *a*, *c*, *d* 58.5 ×; *b* 15.75 ×.

The polyps (figs. 15 *b*, *c*, *d* and 16) are inserted on the front of the colony, in a single series on the branches of higher order, which is not so obvious on the thicker branches, where they are not so crowded either. The interpolypar distance is 1.2 mm.; the length of the tentacles is 0.1—0.15 mm.; the diameter of the oral cone is 0.15—0.2 mm. The tentacles are low, knobby and rounded; the oral cone is also low but very broad. The sagittal tentacles are inserted at a lower level than

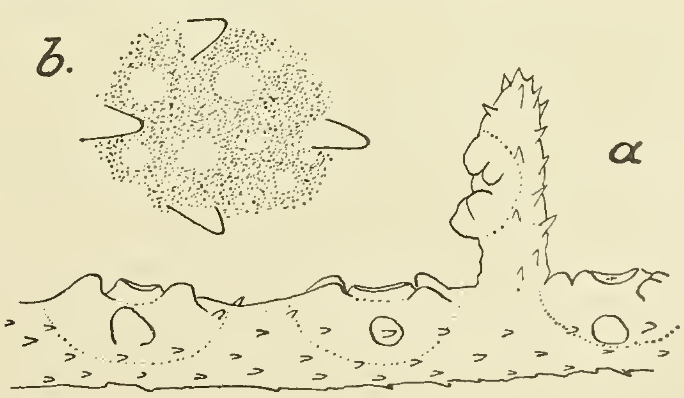

Fig. 16. *Euantipathes myriophylla* (Pall.) n. n. *a* Polyps; *b*. coenenchyma with spots and spine-tops; *a* 21 ×; *b* 78 ×.

the lateral ones (the terrace, formed by these lateral tentacles and the oral cone is in the figs. 15*b* and 16*a* given by a dotted line between the lateral tentacles). — Striking is the chalk-white colour of the lips, which also show many folds (fig. 15*d*); the mouth itself is rounded or sagittally elongated. The oral cone and the tentacles are covered with warts, with a light spot on their top (fig. 15*c*), which spots lie in alternating circles. The light spots occur through the disappearing of the darkbrown pigment which colours the entire polyp; somewhat more thinly distributed this same pigment colours the coenenchyma lighter, and here also (fig. 16*b*) spots without pigment occur [1]). The form of the polyps indicates an *Antipathes*-character, while the spines have sometimes an *Aphanipathes*-character as BROOK understands it, but not enough to place this species in the subgenus *Aphanipathes*.

The primary branches of the colony-fragment of station 117 are of unequal length and are inserted in two rows, almost in the same plane; their further distribution is irregular. The angle, they make with the stem, is about 60°; they bear secondary branches, and these sometimes tertiary branches, which are inserted on one side of the colony, at right angles with the bearing branch or distally inclined. These secondary branches stand in two rows, which are at an acute angle with one another, but not very regularly. — The length of the spines (fig. 17) is 150 μ; their mutual distance is 125 μ; they are arranged in 5 longitudinal rows, which alternate in a quincunx. The top of the spine is granulated while the base is smooth (fig. 17*b* and *c*). On the older parts of the colony (fig. 17*c*) the spines are somewhat longer (180 μ), more irregularly and sparingly distributed while the shape is more like a needle. Both sides of the axis differ principally in the form of the spines (blunt spines and aculeate ones).

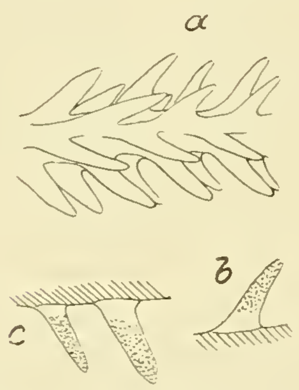

Fig. 17. *Euantipathes myriophylla* (Pall.) n. n. *a* Spines on the toppart of a pinnula (the surface-roughness is omitted): *b* spine; *c* spines on the base of an ultimate branchlet: *a*, *b*, *c* 52 ×.

The specimen of station 250 is a fragment of a colony; the stem is 1.4 cm. in length, and bears two branches to the left and two to the right, all nearly in the same plane and at a mutual distance of ± 3 mm., and further a few smaller branches. The secondary branches, ± 1 cm. lang, which value varies to the length of the primary branches, are almost arranged in two rows; they are straight and they stand at an angle of 60° with the primary branch; the angle between the two rows is obtuse. The tertiary branches have a length of 3—5 mm.; they are inserted under an angle of 60°, and also in two rows which are at an obtuse angle with one another. These branchlets are more acute than in the specimens of stations 117 or 257, and more slender. — On the top of the branches the spines are small, but on a distance of 1 mm. from the top they are much larger. The form of the spines is as in fig. 15*a* but the surface of the spine is slightly granulated; their mutual distance is 225 μ. The five longitudinal rows alternate in a quincunx. The spines perforate the coenenchyma but not the polyps. On the stem the arrangement is not so regular, the number of rows or fragments of rows is greater and the spines are more slender.

1) For the distribution of this pigment and the white spots, see the description of this species in the anatomical part.

The polyps (fig. 18) are inserted only on the front of the colony; they are white with spots on low warts; on the coenenchyma these spots are not so apparent. — The length of the tentacles is 0.5 mm.; the diameter of the rounded oral cone is 0.3 mm. The mouth is small; the interpolypar distance is over 1 mm., but sometimes the polyps are more crowded. — Very rarely young polyps occur between the adult ones, but on the ultimate branches the polyps are smaller.

Fig. 18. *Euantipathes myriophylla* (Pall.) n. n. Polyps; 14 ×.

The first specimen of station 305 is 6 cm. long and has a complete base with basal plate. The stem is straight for the first 1.5 cm., then curved laterally and afterwards straight again. On the curved part a straight branch is inserted, directed upwards and 2.75 cm. long. The stem, except the first straight part, which shows only broken stumps, as well as the branch bear secondary branches, alternating regularly right and left, with a mutual distance of 3 mm. in the same row, and a length which is about 7 mm. and which is shorter on the top of the colony; they are always inserted at an angle of 67.5°. They lie nearly in the same plane as the stem and the large branch. Many branches bear one (seldom two, rarely three) straight tertiary branches, which may be inserted on all sides, always at an angle of 45° with the branch of lower order. They can attain the same length as the secondary branches. As their diameter diminishes swiftly, they are spineshaped.

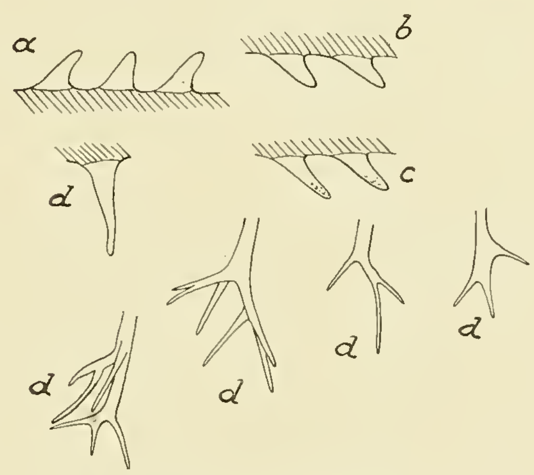

Fig. 19. *Euantipathes myriophylla* (Pall.) n. n. *a*, *b* Spines on opposite sides of a branchlet; *c* spine on the base of a branchlet; *d* spines, branched to a various degree; *a*, *b*, *c*, *d* 52 ×.

The spines (fig. 19) are arranged in 4 (—5) longitudinal rows, alternating in a quincunx, but sometimes showing irregular places. The length of the spines is 90 μ and 75 μ; the spines on the upper frontal side of the branches are more distally inclined (fig. 19*b*) than on the other side (fig. 19*a*). — Their mutual distance is 120 μ; the surface of the spines is smooth, except the top at the utmost (fig. 19*c*). A few doubled spines occur between the normal ones on the branches, while at the base of the branch the top of some spines is forked. The stem however has still principally normal spines; only at the base of the stem branched antlershaped spines appear (fig. 19*d*); their length increases with the degree of branching. The distribution of the spines on the base of the stem is entirely irregular; the surface of the spines is sometimes slightly granulated.

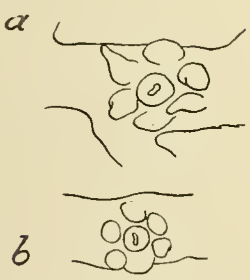

Fig. 20. *Euantipathes myriophylla* (Pall.) n. n. *a* Polyp on the stem of the colony; *b* polyp on the base of a branch; *a*, *b* 14 ×.

The polyps (fig. 20) have nearly all disappeared; the rests occur on one side of the colony only. The oral cone is domeshaped, its diameter is 0.3 mm. and on its top lies the sagittally elongated mouth. On the stem the interpolypar distance is 1.25 mm. and on the

branches 0.9 mm. The tentacles, rounded and often with a broader base, show the regular rows of spots, which are not so very obvious through the white colour of the polyps. On the branches the polyps are very slightly elongated in the direction of the colony-axis, but this is not always the case.

The second specimen of the same station is also complete as to the base, but the stem is broken after 1.75 cm. At an angle of 60° the stem bears an almost straight branch of 5 cm. length. The six left and right secondary branches alternate as regularly as in the other specimen, with a mutual distance of 2 mm. in a row, and inserted at an angle of ± 60°; the last branch is the largest one. Their length is of an average 6 mm; some of them attain a length of 1—1.25 cm. All branches lie again in the same plane as the stem and the primary branch. The tertiary as well as the rare quarterly branches are all of them inserted at an angle of 60° and directed towards the front of the colony, but inclined on the plane of the colony. Their length is 2—4 mm.; they are straight or somewhat curved, and spine-shaped.

The spines (fig. 21) are arranged in five longitudinal rows, which alternate in a quincunx; on the older parts of the colony there are more rows. The length of the spines is 120 μ on all sides of the axis; only the top of the spines is granulated (fig. 21*a*); the mutual distance in a row is 165 μ. — On the stem and the large branch the distribution of the spines is more irregular; on the base of the stem a very high degree of branching of the spines suddenly appears, giving a very bushy effect (fig. 21*b*). Their length increases there to 750 μ and their surface is entirely smooth.

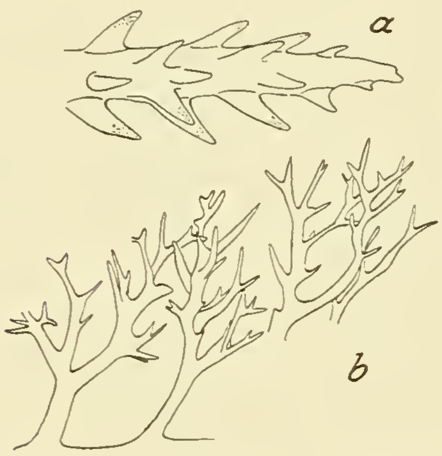

Fig. 21. *Euantipathes myriophylla* (Pall.) n. n. *a* Spines on the top of a pinnula: *b* spines on the base of the colony-stem: *a*, *b* 52 ×.


Fig. 22. *Euantipathes myriophylla* (Pall.) n. n. Polyp on an ultimate branch. 21 ×.

The polyps (fig. 22) are the same as in the other specimens; on the branches the shape of the polyps is quite the same as on the stem, even on the more distal parts of the branches. The tentacles are knobby or sometimes rather elongated (0.5 mm.). The spines perforate the coenenchyma but not the polyps (fig. 22).

The colony-fragment of station 100 bears branches, which diminish in length distally but not regularly (max. 1 cm.). They are arranged in two rows which are at a very obtuse angle with one another and wherein the branches regularly alternate to the right and to the left. Their mutual distance in a row is 2 mm. or somewhat less. Some branches are inserted well to the front of the colony. All branches bear branchlets of higher order, some mm. in length. The branches, also the secondary ones, are always inserted at an angle of 60°. The secondary branches are spine-shaped and directed towards the front of the colony, usually somewhat inclined.

There are 5 longitudinal rows of spines, alternating quincunxially. The length of the spines is 120 μ: their mutual distance is 135 μ. Their top is slightly granulated, the base is smooth. On the stem the spines are aculeate, and some spines even show an inclination to have a forked top. The distribution of the spines remains regular.

STATION OR SPECIES	branches inserted on one side of the colony only	number of longitudinal rows of spines	length of the spines	mutual distance of the spines in a row	inter-polypar distance	length of the tentacles	diameter of oral cone	mouth	angle between branch and stem	angle between branch of highest order and its bearing branch	length of branch of highest order	branched spines on the base of the stem	surface of the spines	branches alternate regularly	mutual distance of the branches (primary)	REMARKS
257	yes	5(—6) 1) and quincunx	165 μ and 120 μ	270 μ	1.2 mm.	0.1–0.15 mm.	0.15–0.2 mm.	round or sagittally elongated 2)	90° or somewhat less	90° or somewhat less	3 mm.	no	smooth or slightly granulated	no (except on a few branches)	some mm. to 1 cm.	1) on the stem irregular and in great number 2) lips chalk-white
305α	no	4(—5) 1) and quincunx	90 μ and 75 μ	120 μ	0.9 mm. on the branches to 1.25 mm. on the stem	0.3 mm.	0.3 mm.	sagittally elongated	67.5°	45°	max. 7 mm.	yes	smooth or slightly granulated	yes	3 mm.	1) irregular on the base of the stem
305β	yes	5 1) and quincunx	120 μ	165 μ	0.9 mm. on the branches to 1.25 mm. on stem	0.5 mm.	0.3 mm.	sagittally elongated	60°	60°	2—4 mm.	yes (in a high degree)	smooth (top slightly gran.)	yes	2 mm.	1) a greater number of rows on the older parts
250	yes	5 1) and quincunx	165 μ and 120 μ	225 μ	over 1 mm.	0.5 mm.	0.3 mm.	small, round	60°	60°	3—5 mm.	no ? (base is absent)	slightly granulated	yes	3 mm.	1) greater number of rows on the stem and not so regularly distributed
117	yes	5 1) and quincunx	150 μ (on older parts: 180 μ)	125 μ	?	?	?	?	60°	90° or somewhat less	2—3 mm.	no ? (base is absent)	top is granulated	no	varies up to 4 mm.	1) on the older parts: irregularly and sparingly distributed
100	yes	5 and quincunx	120 μ	135 μ	?	?	?	?	60°	60°	2—3 mm.	yes	top is granulated	yes	2 mm.	
[*Antipathes*] *myriophylla* Pall.	yes	6—7 1) and quincunx	95 μ 2)	120 μ 2)	?	?	?	?	60° 2)	60° 2)	3 mm. 2)	?	?	no 2)	2.3 mm. 2)	1) after BROOK's figure rather five 2) after BROOK's figures
Antipathes sealarki F. C.	yes	not given	200 μ max.	not given	1.5 mm. 1)	not given	not given	not given	60° 1)	60° 1)	less than 0.5 mm.	base is absent	slightly roughened	partly; pinnules in pairs	not given	1) deduced from COOPER's figures

In the tabel I have given a short review of the principal characteristics of the described specimens, of BROOK's [*Antipathes*] *myriophylla* Pallas and of *Antipathes sealarki* F. Cooper. Although some specimens at first sight might be considered as new species, I am of opinion, that, in connection with the same phenomena by *Eubathypathes patula* (Br.), it will be better to join all specimens under the name of *Euantipathes myriophylla* (Pall.) n. n. The tabel makes it obvious that nearly no characteristic is to be found unchanged in all colonies. Either the mode of branching, either the number of rows of spines, either the dimensions of the polyps or of the spines, all of these can show rather great deviations, but there are always intermediate forms. Since in each station only one or two specimens are captured, it is not possible to speak with certainty of varieties. — It is remarkable that both specimens of station 305 diverge in various characteristics, although the fact that both of them have the spines on their base branched to an exceedingly high degree might justify our looking upon them as a local variety. In various other species of other genera viz. *Aphanipathes wollastoni*, var. *pillosa* Johnson, [*Antipathes*] *tanacetum* Pourt., [*Antipathes*] *spinosa* (Carter), *Stichopathes variabilis* Silb. var. *longispina* var. n., *Antipathella rugosa* T. and S. antlershaped spines occur on the base of the colony (perhaps the last-named species could also be included into *Euantipathes myriophylla*). The polyps, not described till now, justify the placing of this species in the genus *Antipathes*, subgenus *Euantipathes*.

Diagnosis:

COLONY: All branches approximately in a plane; the ultimate branches are inserted on one side of the colony; angle of 60° between the branches and the branch, which bears them; ultimate branches spine-shaped.

SPINES: 5 longitudinal rows on the branches; spines distally inclined; their surface smooth, except the top; distance 120—270 μ; length 75—165 μ; branched spines on the base of the colony or at least aculeate spines on the older parts of the colony.

POLYPS: Knob-shaped tentacles, 0.1—0.5 mm. long, radiate; oral cone dome-shaped (diameter 0.15—0.3 mm.) with round or sagittally elongated mouth. Interpolypar distance 0.9—1.25 mm.

Former habitat. PALLAS Indic; ELLIS Batavia; CUMING Philippines; COOPER Providence, D 4, 50—78 fm.

3. *Euantipathes plana* (F. C.) n. n.

Antipathes plana F. Cooper. COOPER, Antipatharia (Percy Sl. Tr. Exp.), p. 317, figs. 14, 14*a*.

Stat. 305. Solor-strait. 113 M. Stony bottom. 1 spec.

This incomplete colony is by some basal branches attached to a stone, but its real base is certainly lacking. The colony is fan-shaped, extended in a plane; the greatest breadth is 8 cm., the greatest height is $8^1/_2$ cm. The entire colony is highly branched; every branch is curved upwards, after having been nearly at right angles with the branch which bears them. The fusions, which repeatedly occur between the branches, make a strong network of the colony.

Only on the leftborder of the colony a branch is apparent which is stronger than the other ones; but further there are no stems to be distinguished. The ultimate branchlets, a few mm. in length, are all more or less directed towards the anterior side of the colony.

The spines (fig. 23), the surface of which is entirely smooth, have their distal side at right angles with the axis or inclined slightly distally, and their proximal side inclined. Their length, nearly equal on all sides of the axis, is 100 μ. — They are arranged in four longitudinal rows, which alternate in a quincunx; the mutual distance of the spines is 210 μ. — On the older parts of the colony the distribution is just as regular; if possible, here the spines are inserted steeper on the axis. — The polyps (fig. 24), badly preserved, are white and inserted only on the front of the colony. They are small and cushion-like; often the spines are dimly to be seen through the parts of the polyps; the spines perforate the transparent coenenchyma. The interpolypar distance is 0.75—1.1 mm. The tentacles are knob-shaped; the oral cone, the diameter of which is 180 μ, is dome-shaped; the mouth is round. The sagittal tentacles are inserted at a slightly lower level than the lateral ones; on the thinner terminal branches the polyps are somewhat elongated in a transversal direction.

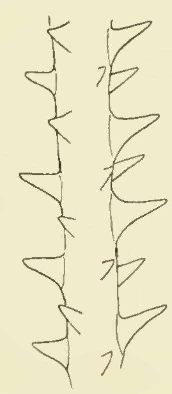

Fig. 23. *Euantipathes plana* (F. C.) n. n. Spines on an ultimate branch; 58.5 ×.

The mode of branching is very like *Antipathes plana* F. C., and also like some *Antipathella*-species of Brook, but none of the latter have the typical curving of the branches upwards, after the insertion at right angles. The location of the ultimate branches on one side of the colony reminds of the colonies of *Euantipathes myriophylla* Pallas, although fusions between the branches do not occur in this species. Brook's genus *Tylopathes*, the ultimate branches of which are placed not laterally but on the antero-lateral side, contains some species, especially *Tylopathes flabellum* Br. (= *Euantipathes flabellum* Brook) which in regard to the type of their spines, are nearly related to this species. However, there is no entire concord to be found between one of these species and the described specimen.

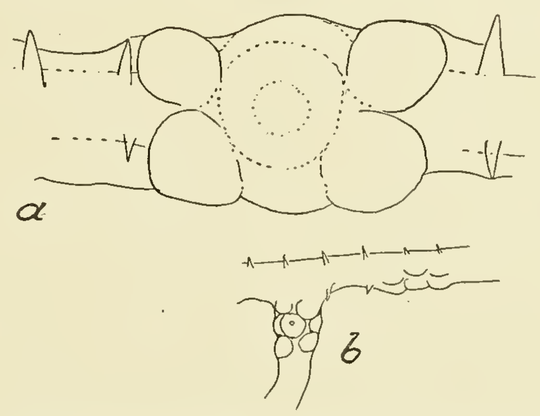

Fig. 24. *Euantipathes plana* (F. C.) n. n. *a* Polyp; *b* two polyps; *a* 58.5 ×; *b* 15.75 ×.

Diagnosis:

Colony: Short stem; branched in a plane; fan-shaped; network through frequent fusions. Branches often inserted at right angles, and afterwards curved upwards. — Ultimate branches (a few mm. in length) are inserted on the anterior side of the colony.

Spines: Smooth; distal side at right angles with the axis. Length 100—200 μ; 4 longitudinal rows with a mutual distance between the spines of 210 μ.

Polyps: Tentacles rounded, knobshaped, radiate. Oral cone dome-shaped with round mouth. Diameter of oral cone 180 μ; interpolypar distance 0.75—1.1 mm.

Former habitat. Cooper. Salomon Atoll (Chagos) 65 fm.

4. *Euantipathes japonica* (Brook) emend.

[*Antipathes*] *japonica* Br. BROOK, Chall. Rep. Antipatharia, p. 169, pl. XI, fig. 25.
[*Antipathes*] *bifaria* Br. BROOK, Chall. Rep. Antipatharia, p. 170, pl. XI, fig. 20.

Stat. 299. 10° 52'.4 S., 123° 1'.1 E. Buka- or Cyrus-bay, Rotti-island. 34 M. Mud, coral and Lithothamnion. 1 spec.

This colony, covered with well preserved polyps, is snapped off, obviously near the base. The height of the colony is 30 cm.; the length of the curved stem is 40 cm.; the basal diameter of the axis is 4 mm. All principal branches lie in the same plane; the stem is curved to the left and tapers gradually. There are two longitudinal rows of branches, inserted antero-laterally, at an angle of over 45° with the axis; afterwards their course is more horizontal, while their top is curved upwards again. Besides the branches are curved somewhat backwards, so that both rows after all deviate less from the plane of the colony than at their origin. The members of both rows regularly alternate to the right and to the left, with a mutual distance of always 4 mm. in a row. The length of the branches is variable; the left row, which has the longer branches, shows lengthes of 8 cm., wherebetween shorter ones occur. The right row has branches of nearly half the length of those on the left. Towards the top of the colony the length of the branches diminishes, but not much. Some branches are strongly developed; these principal branches are one to the left of 20 cm. and one to the right which surpasses the stem in length and is curved in the same direction as the stem. These principal branches are branched after the same manner as the stem, but right and left row of branches are of equal length (up to 10 cm. and over); the first dm. of the right branch however has only branches 2—3 cm. in length. All the branches have the same characteristics as those on the stem. The secondary branches, which occur on all described branches, are directed towards the anterior side of the colony. They are inserted at an angle of ± 45° at a mutual distance of ± 4 mm. and either in two rows, which are at a mutual very acute angle or in one single row. Many secondary branches bear tertiary ones before the branchlets are inserted on the anterior side of the colony. The length of the ultimate branches is max. 2 cm., but this value is very variable. — The base of the colony only bears stumps of broken branches. The plane of the colony is curved backwards. The stem and the branches differ very much in diameter, except the principal branches; by the other branches the diameter diminishes gradually.

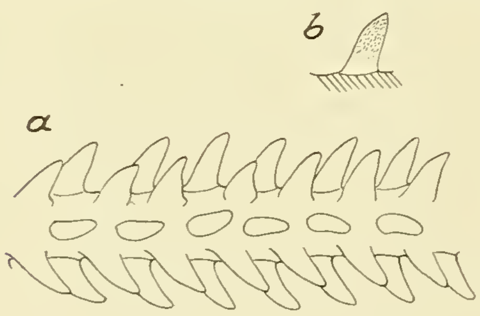

Fig. 25. *Euantipathes japonica* (Br.) em. *a* Spines on a pinnula; the surface-roughness, which is omitted, is shown in *b*; *a*, *b* 52 ×.

The spines (fig. 25) are inclined distally with a concave distal side and a convex proximal one; the top is rather obtuse. On the older parts of the axis the spines become more slender and aculeate. The top of the spines is slightly granulated (fig. 25*b*; omitted in *a*). There are five longitudinal rows, alternating in a regular quincunx, which in some places disappears through shifting of the rows; on the older parts the distribution is irregular. The length of the spines is 135 μ, subequal on every side of

the axis; only in degree of inclination the spines of opposite sides differ (fig. 25 *a*). The mutual distance is 105 μ; the spines do not perforate the polyps.

The polyps (figs. 26, 27, 28) are inserted on the convex side of the colony-plane, always in a single series. On the younger parts the interpolypar distance is 0.8 mm., which value increases on the older parts. The sagittal tentacles are inserted at a slightly lower level than the lateral ones. The length of the sagittal tentacles is 0.25 mm., of the lateral ones 0.3 mm. The diameter of the cylindrical oral cone (fig. 27 *a*) is 0.375 mm., the diameter of the mouth (if rounded) 0.15 mm., but the mouth is in some cases a transversally elongated slit (both forms occur in fig. 28). On the younger branches the polyps are somewhat transversally elongated (fig. 28 *a*), but on the older parts the tentacles are radiate (fig. 28 *b* and *c*). The spines perforate the coenenchyma. The coenenchyma and the polyps show glassy spots on a milk-white ground (fig. 27 *b*); this spots stand on warts in concentrical rows round the tentacles and the oral cone. There are no young polyps between the adult ones.

Fig. 26. *Euantipathes japonica* (Br.) em. Polyps; 14 ×.

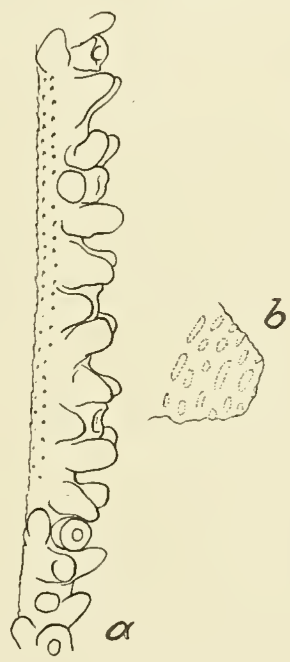

Fig. 27. *Euantipathes japonica* (Br.) em. *a* Polyps; *b* tentacles with spots; *a* 14 ×; *b* 52 ×.

The description of this specimen is very much like that of [*Antipathes*] *bifaria* Brook. Since the specific differences between [*Antipathes*] *bifaria* Brook and [*Antipathes*] *japonica* Brook are, after Brook, principally the mode of insertion of the ultimate branches, well or not in two rows, at an acute angle with one another, I am of opinion that the fact of the Siboga-specimen showing both modes of insertion of the ultimate branches on the same colony, is sufficient to unite both Brook's species. The polyps, not described till now, make it very apparent to which genus this [*Antipathes*]-species belongs.

[*Antipathes*] *ulex* E. and S. has also a mode of branching which is very much like the described one. The spines, which Brook describes, are 150 μ long, they have a distance of 225 μ and they are arranged in five longitudinal rows, so that it is very probable that, if the range of variability is better known, this species should be included in the species under consideration. As [*Antipathes*] *spinosa* (Carter) is very closely related to [*Antipathes*] *ulex* E. and S., as Brook remarks himself, and differs principally in having dendritic spines near the base of the stem, it is to be remarked that the slender and aculeate spines on older parts are in other cases oftentimes a sign that on the base of the colony branched spines can occur. The Siboga-specimen of *Euantipathes japonica* could in this respect be an intermediate form between [*Antipathes*] *ulex* and *spinosa*. But since the material is not ample enough, I will for the time being not take a decision on this head and only indicate a possible union of all this forms; perhaps the line of nearly related forms could be extended towards *Euantipathes myriophylla* (Pall.), so that all of Brook's

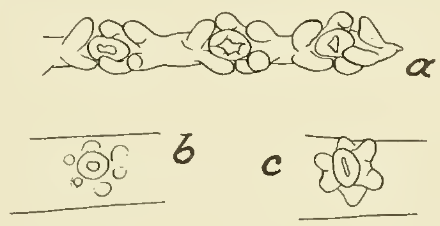

Fig. 28. *Euantipathes japonica* (Br.) em. *a* Polyps on the top of an ultimate branchlet; *b*, *c* polyps on a larger branch; *a*, *b*, *c* 11.3 ×.

"species related to *Antipathes myriophylla* Pall. in type of branching" could be united in one species.

Diagnosis:

Colony: Nearly in one plane. Pinnate branches, inserted at an angle of 45°. Ultimate branches on the anterior side of the colony, either in two rows at an acute angle or in a single row.

Spines: Inclined distally; concave distal side, convex proximal side. Smooth base and granulated top. Five longitudinal rows. Distance 105 μ; length 135 μ.

Polyps: Cylindrical tentacles and oral cone; tentacles radiate or slightly transversally shifted on the younger branches. Length of tentacles 0.25—0.3 mm. Interpolypar distance 0.8 mm. — Mouth round or transversally elongated.

Former habitat. Burge, Inosima (Japan); Brook, Formosa (Swinhoe; Br. Mus.).

5. *Euantipathes dichotoma* (Pallas) emend.

Antipathes dichotoma Pallas. Pallas, El. Zooph., p. 216; Dana, Zooph., p. 585; Milne Edwards, Coralliaires, t. I, p. 319; Brook, Chall. Rep. Antipatharia, p. 98, pl. XII, fig. 16; pl. XIII, figs. 1, 9; pl. XIV, figs. 1, 5, 6.

Litophyte No. 9. Marsigli, Hist. phys. de la Mer, p. 105 and 108, pl. 21, figs. 101, 102, 103; pl. 40, fig. 179.

Antipathes arborea Dana. Dana, Zooph., p. 584, pl. 56, figs. 2, 2*a*; Milne Edwards, Coralliaires, p. 319, pl. C_2, figs. 6*a*, 6*b*; Pourtalès, Bull. Mus. Comp. Zool., vol. VI, pl. 3, fig. 21; Brook, Chall. Rep. Antipatharia, p. 100.

Foenum marinum Rumphius, Herb. Amboin., lib. XII, cap. 6, pl. LXXX, fig. 3.

Antipathes foeniculacea Pallas (non Esper). Pallas, El. Zooph., p. 207.

Antipathes foeniculum Lamarck. Lamarck, Hist. nat. anim. s. vert., t. II, p. 308; Lamouroux, Polyp. flex., p. 379, Encycl. méth., t. IV, p. 71; Blainville, Manuel d'Act., p. 583; Dana, Zooph., p. 582; Milne Edwards, Coralliaires, t. I, p. 318; Studer, Monatsber. Akad. Berlin 1878, p. 548; Brook, Chall. Rep. Antipatharia, p. 101.

Antipathes virgata Esp. Esper, Pflanzenthiere, Fortsetz. pt. II, p. 8, pl. XIV; Brook, Chall. Rep. Antipatharia, p. 102, pl. XI, figs. 13, 14; L. Roule, Antipathaires et Cérianthaires, Campagnes Scientifiques du Prince de Monaco, fasc. XXX, p. 77; Cooper, Antipatharia (Percy Sl. Tr. Exp.), p. 314, fig. 12.

Antipathes scoparia Lamarck. Lamarck, Hist. nat. anim. s. vert., t. II, p. 307; Milne Edwards, Coralliaires, t. I, p. 319.

Antipathes ? lentipinna Brook. Brook, Chall. Rep. Antipatharia, p. 103, pl. XI, fig. 19.

Antipathes ? mediterranea Brook. Brook, Chall. Rep. Antipatharia, p. 104 and 105, pl. XI, fig. 9.

Antipathes furcata Gray. Brook, Chall. Rep. Antipatharia, p. 104, Pl. XI, fig. 2; Gray, Proc. Zool. Soc. London 1857, p. 291; Schultze, Die Antipatharien der deutschen Tiefsee-Expedition 1898—1899. "Valdivia", Bd. III, Lief. II, p. 90.

Antipathes furcata Gray var. *α* Schultze. Schultze, Die Antip. der deutschen Tiefsee-Exp. 1898—1899, "Valdivia", Bd. III, Lief. II, p. 92, Taf. XIII, fig. 5; Taf. XIV, figs. 10, 14.

Antipathes furcata Gray var. *β* Schultze. Schultze, Die Antip. der deutschen Tiefsee-Exp. 1898—1899. "Valdivia", Bd. III, Lief. II, p. 93, Taf. XIII, fig. 1; Taf. XIV, figs. 11, 12.

Antipathes aenea v. K. G. von Koch, Die Antipathiden des Golfes von Neapel, Mitth. a. d. Zool. St. z. Neapel, Bd. IX, 1889—1891. 2. Heft, p. 202 a. f., fig. 10.

Antipathes gracilis v. K. G. VON KOCH, Die Antip. des Golfes von Neapel, Mitth. a. d. Zool. St. z. Neapel, Bd. IX, 1889—1891, 2. Heft, p. 196 a. f., fig. 7.

Antipathes viminalis Roule. L. ROULE, Antip. et Cérianth., Camp. Sc. du Pr. de Monaco, fasc. XXX, p. 67, pl. II, fig. 1; pl. VII, figs. 2, 2*a*.

Antipathella gracilis Gray. GRAY, Ann. and Mag. Nat. Hist., ser. 3, vol. VI, 1860, p. 311; BROOK, Chall. Rep. Antipatharia, p. 113, pl. XI, fig. 8; L. ROULE, Antip. et Cérianth., Camp. Sc. du Pr. de Monaco. fasc. XXX, p. 69, pl. II, fig. 2; pl. VII, figs. 3, 3*a*; JOHNSON, Notes on the Antipatharian corals of Madeira, Proc. Zool. Soc. London 1899; COOPER, Antipatharia (Percy Tr. Sl. Exp.), p. 314, fig. 10.

Antipathella Brooki Johns. JOHNSON, Notes on the Antip. corals of Madeira, Proc. Zool. Soc. London 1899.

Antipathella elegans T. & S. THOMSON and SIMPSON, On the Antipatharia, Report to the Government of Ceylon, etc., Suppl. Rep. 25.

Paratylopathes atlantica Roule. L. ROULE, Antip. et Cérianth., Camp. Sc. du Pr. de Monaco, fasc. XXX, p. 70, pl. IV, fig. 2; pl. VII, figs. 6, 6*a*, 6*b*, 6*c*. (= *Tylopathes atlantica* Roule. Notice Préliminaire, Mém. de la Soc. Zool. de Fr., t. XV, p. 228, 1902.)

Paratylopathes Grayi Roule. L. ROULE, Antip. et Cérianth., Camp. Sc. du Pr. de Monaco, fasc. XXX, p. 72, pl. IV, fig. 3; pl. VII, figs. 5, 5*a*. (= *Tylopathes Grayi* Roule. Notice Préliminaire, Mém. de la Soc. Zool. de Fr., t. XV, p. 228, 1902).

Antipathes grandiflora Silb. E. SILBERFELD, Japanische Antipatharien. Beitr. zur Naturgesch. Ostasiens, 1909, Bd. I, Lief. 8 (Abh. d. Math. phys. Kl. d. K. Bayer. Ak. d. Wiss. 1. Suppl. Bd., 7. Abh.), p. 26.

Antipathes pseudodichotoma Silb. E. SILBERFELD, Jap. Antip., Beitr. zur Naturgesch. Ostasiens, 1909, Bd. 1, Lief. 8 (Abh. d. Math. phys. Kl. d. K. Bayer. Ak. d. Wiss., 1. Suppl. Bd., 7. Abh.), p. 27.

Stat. 7. 7° 55'.5 S., 114° 26' E. Near Batjulmati (Java). 15 M. and more. Coral and stones. 1 spec.
Stat. 47. Bay of Bima. 55 M. Mud with patches of fine coral sand. 1 spec.
Stat. 50. Bay of Badjo, Flores. Up to 40 M. Mud, sand and shells. 1 spec.
Stat. 64. Tanah Djampeah, Kambaragi-bay. Up to 32 M. Coral and coralsand. 1 spec.
Stat. 79ª. 2° 38'.5 S., 117° 46' E. Borneo-bank. 54 M. Fine coralsand. 1 spec.
Stat. 80. 2° 25' S., 117° 43' E. Borneo-bank. From 50—40 M. Fine coralsand. 2 spec.
Stat. 95. 5° 43'.5 N., 119° 40' E. Sulu-sea. 522 M. Stony bottom. 1 spec.
Stat. 119. 1° 33'.5 N., 124° 41' E. Sulu-sea. 1901 M. Stony bottom. 1 spec.
Stat. 144. Anchorage North of Salomakiëe-(Damar-)island. 45 M. Coral and Lithothamnion. 1 spec.
Stat. 164. 1° 42'.5 S., 130° 47'.5 E. Arafura-sea. 32 M. Sand, small stones and shells. 1 spec.
Stat. 184. South coast of Manipa-island. 36 M. Coral sand. 4 spec.
Stat. 193. Sanana-bay, East coast of Sula Besi. 22 M. Mud. 2 spec.
Stat. 204. 4° 20' S., 122° 58' E. Between islands of Wowoni and Buton. 75—94 M. Sand with dead shells. 2 spec.
Stat. 213. Anchorage off Saleyer. Up to 36 M. Mud and mud with sand. 1 spec.
Stat. 240. Banda. From 9—45 M. Black sand, coral. 1 spec.
Stat. 250. Island Kur. 20—45 M. Coral and Lithothamnion. 7 spec.
Stat. 257. Du-roa-strait, Kei-islands. Till 52 M. Coral. 1 spec.
Stat. 302. 10° 27'.9 S., 123° 28'.7 E. Timor-sea. 216 M. Sand and coral sand. 3 spec.
Stat. 305. Mid-channel in Solor-strait. 113 M. Stony. 1 spec.
Stat. 310. 8° 30' S., 119° 7'.5 E. Flores-sea. 73 M. Sand with few pieces of dead coral. 1 spec.
Stat. 313. Saleh-bay, East of Dangar Besar. Up to 36 M. Sand, coral and mud. 2 spec.

The three specimens of station 302 are all of them complete colonies, severally 1 dm., 1.4 dm. and 2 dm. long, in possession of a round basal plate with a diameter of 2 mm. All are branched pseudodichotomically; for instance: the largest colony has a slightly sinuous stem, upright in the main, and with a diameter of 0.75 mm. at its base. On a height of

1.75 cm. the first branch appears. The further stem, as well as this branch itself, bears branches (five in number) in the same manner, with a mutual distance of 1—3 cm. They are over 1 cm. in length or so long that they end on the same level as the stem. Although the first fork indicates a plane which remains obvious, the other branches are inserted in every possible direction. The fork-angle is 30°—45°.

The spines (fig. 29*a*) are triangular, with their distal side usually somewhat steeper than their proximal side. There are four longitudinal rows, alternating in a slanting quincunx; the mutual distance in a row is 300 μ. The surface of the spines is smooth; their length, subequal on all sides of the axis, is 50 μ. — The spines remain regularly distributed to near the base of the colony.

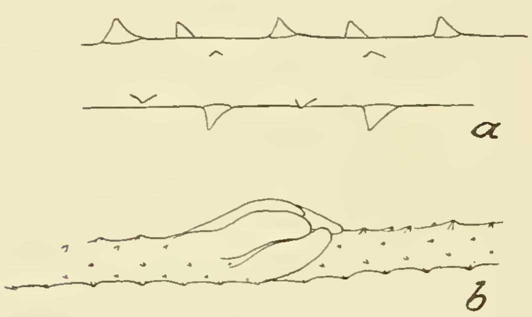

Fig. 29. *Euantipathes dichotoma* (Pall.) n. n. *a* Spines. *b* polyp; *a* 52 ×; *b* 14 ×.

The polyps (figs. 29*b*, 30, 31), inserted in a single series, are not confined to a special side of the colony. Their colour is grayish brown. The proximal pair of lateral tentacles is strikingly larger and more strongly built than the distal pair of lateral ones (fig. 30, *a* and *c*). The sagittal tentacles are inserted on a lower level than the lateral ones. All tentacles are inclined distally in a high degree, so that the oral cone is partially covered by the proximal lateral tentacles. The oral cone itself is elongated in a transversal direction and its distal part is often higher than its proximal part (fig. 30*a*), while the middle part is indented also; sometimes the form is more rounded. The mouth, which is also transversally elongated, is sometimes proximally wider than distally (fig. 30*a*). The length of the proximal lateral tentacles is 0.55 mm., of the distal pair 0.225 mm., of the sagittal ones 0.35—0.4 mm. All these dimensions may be larger or smaller in other polyps, but their mutual proportion remains the same. — The intertentacular distance is 1.9 mm.; the height of the oral cone is 0.25—0.3 mm. On some parts of the colony the polyps are as figured in fig. 31, more transparent while the difference between the two pairs of lateral tentacles is less conspicuous, and they are not so much distally inclined; also the oral cone is distally nearly as high as proximally. — The spines are dimly visible through the coenenchyma, but not through the polyps. — All polyps clearly show their convoluted masses of mesenterial filaments, which are conspicuous by their excessive pigmentation, through the body wall (fig. 31).

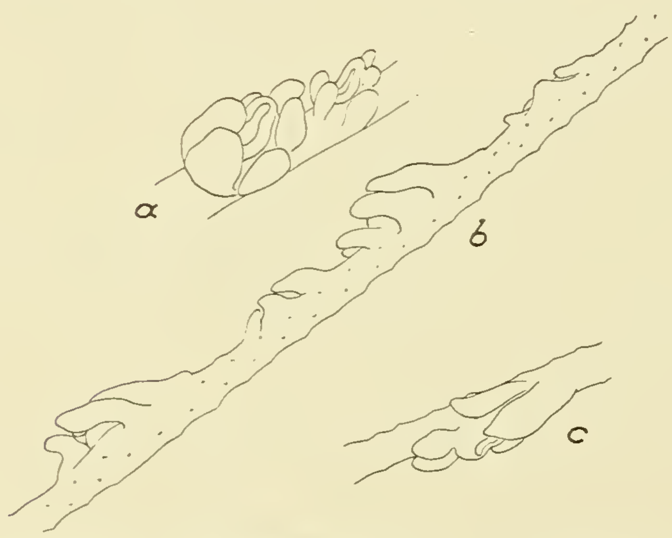

Fig. 30. *Euantipathes dichotoma* (Pall.) n. n. *a*, *b*, *c* Polyps; 14 ×.

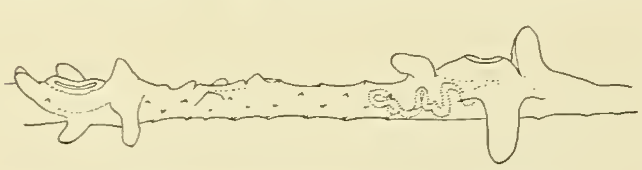
Fig. 31. *Euantipathes dichotoma* (Pall.) n. n. Polyps; 14 ×.

Alternating with the adult polyps young ones occur. — Some polyps have become very large and sit as thick knobs on the branches; in this case it is difficult to discern the separate tentacles. — In one of the colonies the transversal groove between the polyps is very conspicuous.

The colony-fragment of station 64 is a stem of 4 cm., snapped off on both ends and with a diameter of 150 μ. The single branch, inserted at an angle of 60° is repeatedly branched; all branches are inserted at angles of 45°, except one secondary branch which is inserted almost at right angles. All branches are very slender and curved, and they do not lie in a single plane. The length of the branches is 8—9 cm. and their mutual distance is 1.75 cm The ultimate branches are all at the same distance one from the other; their length is 3—4 cm. — Spines in 4 longitudinal rows with a straight or slanting quincunx. Their shape is nearly the same as in the specimens of station 302 (fig. 32). Surface is smooth; length 30 μ; mutual distance 300 μ. On the stem they are arranged somewhat less regularly.

The polyps (fig. 33) have their distal lateral tentacles usually of equal length as the

Fig. 32. *Euantipathes dichotoma* (Pall.) n. n. Spines; 52 ×.

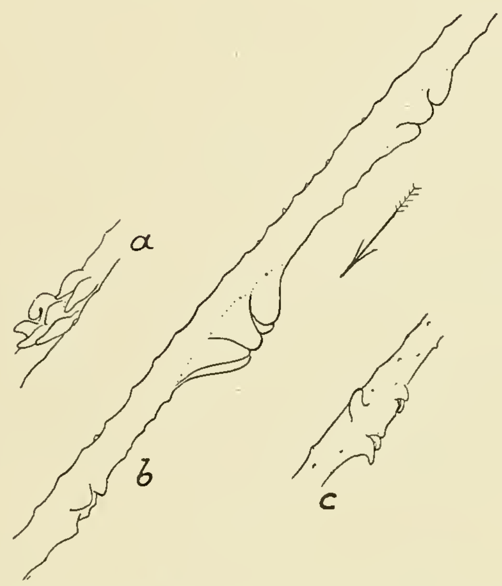

Fig. 33. *Euantipathes dichotoma* (Pall.) n. n. *a*, *b*, *c* Polyps; the arrow indicates the direction towards the colony-top in *b*; *a* is a polyp out of the top of a branch; *a*, *b*, *c* 14 ×.

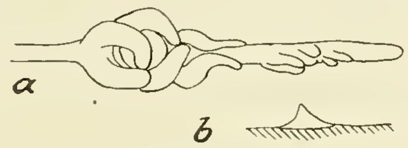

Fig. 34. *Euantipathes dichotoma* (Pall.) n. n. *a* Large polyp on the top of a branch; *b* spine; *a* 14 ×; *b* 52 ×.

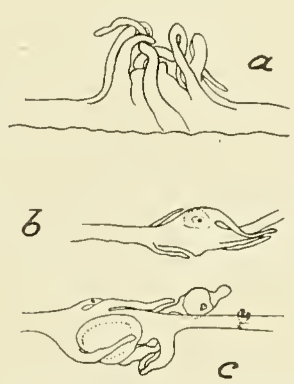

Fig. 35. *Euantipathes dichotoma* (Pall.) n. n. *a* Polyp; *b*, *c* polyps with parasitic bubbles in tentacles and bodywall; *a*, *b*, *c* 14 ×.

proximal pair; rarely a slight difference is visible (fig. 33*b* and *c*). The length of the tentacles is 0.3—0.375 mm.; the intertentacular distance is 1.6 mm. The oral cone is low and rounded; the mouth is very small and nearly not to be discerned. In all other respects the polyps are the same as in station 302. Mesenterial filaments are not visible.

The two very slender, thin (the basal diameter is only 105 μ) and limp colonies of station 193 are branched in the same manner. The branches, inserted on a mutual distance of ± 3 cm., are 3—8 cm. long, and the fork-angle is ± 45°. Polyps and spines are the same as in station 302. The type of fig. 30*b* occurs as well as the type of fig. 31. Also the very swollen polyps, described for the specimens of station 302, can here be found (fig. 34*a*). The tentacles are covered with warts. The spines have a more elongated base on the younger branches (fig. 34*b*).

On one of the colonies the tentacles are more slender (fig. 35*a*), possible a result of the preservation. — In the bodywall or in the tentacles often bubbles occur which are transparent with a darker nucleus; they make the polyps look swollen and distorted (fig. 35*b* and *c*). We easily see that these bubbles are not lying in the gastral cavity, but in the wall itself, between ectoderm and entoderm; I hold them to be of parasitic origin. — The difference

between the distal and proximal pair of lateral tentacles is not very conspicuous. The oral cone has concave sides (fig. 36). The intertentacular distance is 0.75—2 mm., usually 1.5 mm. In one case I saw a pigmentated thread (fig. 37*b*) come from the mouth of a polyp (fig. 37*a*); possibly this is a mesenterial filament projected (by accident?) through the mouth.

Fig. 36. *Euantipathes dichotoma* (Pall.) n. n. Polyp; 14 ×.

The colony of station 47 is also very thin and slender; the basal diameter of 135 μ increases to 225 μ after 8 cm. The stem is curved in a half circle. The branches (length: till 9 cm.) are inserted at angles of 35° or 45°, often curved in an opposite direction as the branch of lower order; they are inserted on a mutual distance of some cm. No polyps. The spines have the type of the young spines of station 193 (fig. 34*b*), but with a longer top. Length 50 μ; distance 345 μ. Five longitudinal rows and a straight or somewhat slanting quincunx. In other respects they are the same as in other stations.

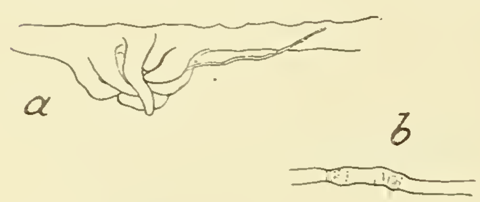

Fig. 37. *Euantipathes dichotoma* (Pall.) n. n. *a* Polyp with a mesenterial filament (enlarged in *b* to show the pigmentation) projecting through the mouth; *a* 15.75 ×.

Both specimens of station 313 are very slender and thin for the stem of 8 cm. has a basal diameter of 165 μ, which diminishes regularly; the branches are curved in half circles. One colony has a single branch of 6.5 cm. at an angle of 60°, and the other colony has a single branch of 10.5 cm., at an angle of 30°. The diameter of the second colony increases from 105 μ to 150 μ before diminishing. — The spines are arranged in 5 (—6) longitudinal rows (fig. 38), alternating in a straight quincunx. Length 35 μ; their mutual distance is very variable: on the branches 225 μ to 300 μ, on the stem 270 μ to 360 μ. The polyps (fig. 39) are inserted in a single series, but not on a special side of the colony, with an intertentacular distance of 1.25 mm. As young polyps (fig. 39*a*, to the left) alternate rather regularly with the adult ones, the mutual distance is, seen with the naked eye, larger, as much as 2.5 mm. The proximal lateral tentacles are somewhat larger than the distal ones (fig. 39*a* and *b*). Transversal grooves between the polyps as well as the longitudinal groove, especially on the top of stem and branches, are visible. The oral cone has concave sides (fig. 40), the mouth (fig. 39*c*) is small and rounded (diameter: 60 μ). The parasitic bubbles occur here also; in fig. 39*a* the adult polyp has a little bubble (indicated by a dotted line), to the right in the coenenchyma.

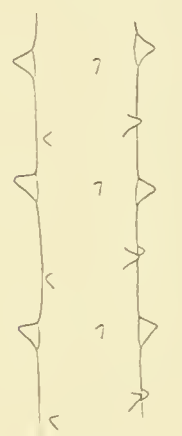

Fig. 38. *Euantipathes dichotoma* (Pall.) n. n. Spines; 52 ×.

One of the two specimens of Saleyer has a curved stem, 15 cm. long, with a branch, near the base, at right angles with it, and after 2.5 cm. a second branch at an angle of 30°. Both branches are 1 cm. long. The other specimen, as slender and thin as the first, has a curved stem of 18 cm. and its branches, which are inserted by preference on the concave side of the axis, at angles of 45° or somewhat less, are curved in their further course towards the stem. The secondary branches have the same characteristics. The length of the

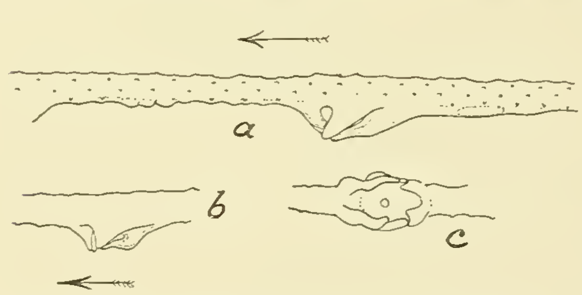

Fig. 39. *Euantipathes dichotoma* (Pall.) n. n. *a*, *b*, *c* Polyps; the arrow in *a* indicates the direction towards the top of the branch; the polyp *a* has a transparent parasitic bubble to the right in the coenenchyma; *a*, *b*, *c* 14 ×.

branches is a few cm. to 18 cm. The sharp spines have an elongated base (fig. 41), a length of 60 μ and a mutual distance of 300 μ; there are 5 longitudinal rows alternating in a straight quincunx. The polyps, of the same shape as in the specimens of station 313, have an intertentacular distance of 1.75—2 mm. The length of the sagittal tentacles is 150 μ, of the lateral ones 180 μ (proximal) and 135 μ (distal).

Fig. 40. *Euantipathes dichotoma* (Pall.) n. n. Polyp; 21 ×.

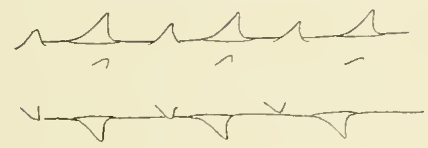

Fig. 41. *Euantipathes dichotoma* (Pall.) n. n. Spines; 52 ×.

The four colonies of station 184 are all of them slender and thin. The stem is curved and its length is respectively 9, 4, 6.5 and 14 cm. The curved branches have a length of a few mm. to 7 cm. and a mutual distance of 3 mm. to 5 cm. They are inserted on all sides of the stem at an angle of 45° or less (30°—45°). A few secondary branches occur at the same angle. The spines (fig. 42) are inclined distally, but in other respects they are very much like those of the former specimen. On one colony they are steeper. — The number of rows is 4 or 4—5 with a straight or slanting quincunx. The length of the spines is 80 μ and 45 μ and their mutual distance is 350 μ. Two colonies have polyps (fig. 43) with a intertentacular distance of 2 mm. or somewhat less, variable through the interpolated young polyps. The tentacles are thin when compared with the large oral cone; the sagittal ones are inserted on a high level. The length of the tentacles is 0.45 mm.; the sagittal diameter of the oral cone is 0.375 mm., the transversal one is 0.4 mm. The mouth is inconspicuous. On one colony the parasitic bubbles occur.

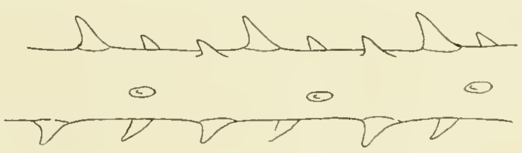

Fig. 42. *Euantipathes dichotoma* (Pall.) n. n. Spines; 52 ×.

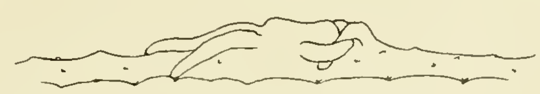

Fig. 43. *Euantipathes dichotoma* (Pall.) n. n. Polyp; 21 ×.

One of the specimens of station 204 has fork-angles of 45° or 60°. The diameter of the stem increases in the first 3 cm., and the same holds true for the first branch but not for the other ones. The length of the branches varies from 1.5 cm. to 11 cm. and their mutual distance is 2.5—2.75 cm. The branches are not lying in the same plane and they are sinuous or straight. The whole colony is thin but strong enough to stand upright. The spines (fig. 44) are triangular and at right angles with the axis. Their length is 45 μ; their distance is 240 μ, and they form four rows in a straight quincunx. The polyps (fig. 45) are white and sit like cushions on the axis, just as Brook indicated as a typical character of his genus *Tylopathes*. They are inserted in a single row with an intertentacular distance of 1.25 mm. There is a great difference in size between the proximal and the distal pair of lateral tentacles; the proximal ones are inserted on a strikingly high level so that the entire polyp is exceedingly distally inclined. The distally inclined oral cone is large and dome-shaped with a small round mouth. The entire polyp is rather transparent; the transversal groove between the polyps is conspicuous.

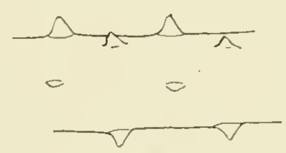

Fig. 44. *Euantipathes dichotoma* (Pall.) n. n. Spines; 52 ×.

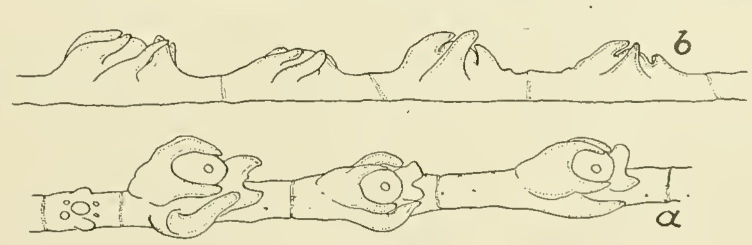

Fig. 45. *Euantipathes dichotoma* (Pall.) *a*, *b* Polyps; *a*, *b* 14 ×.

Young polyps are irregularly distributed between the adult ones; some spines are dimly visible through the coenenchyma. The length of the sagittal tentacles is 0.45 mm., of the proximal lateral ones 0.3 mm., of the distal lateral ones 0.175 mm. The height of the oral cone is 0.25 mm. All these dimensions may be larger or smaller but always in the same proportion. In the young polyps the preponderance of the proximal lateral tentacles is already visible (fig. 45*a*, to the right). — The second specimen of the same station has fork-angles of 45° or upwards of 60°; there is no increase of diameter above the base.

The colony of station 7 is 9 cm. in height, and more slender and thinner than the colony of station 204, but otherwise branched in the same manner. All branches are sinuous; they often exceed the stem in length. The fork-angle is 45°; the branches are curved towards the opposite side as the branch of lower order. The diameter of the axis increases distally and some branches show the same phenomenon. All branches show an inclination to lie in a single plane. The polyps are inserted on one side of the colony. The spines are distributed in 4 longitudinal rows and a straight quincunx. Length 60 μ (somewhat shorter on one side of the axis); mutual distance 240 μ. Shape of the spines: fig. 42. The polyps are the same as in station 204; the intertentacular distance is 1.5 mm., which value varies on various parts of the axis.

The colony of station 50, 10 cm. in length, is branched in the same manner, with fork-angles of 45°—60°. Various branches show an initial increase in diameter. Polyps and spines are the same as in stations 7 and 204. Intertentacular distance: 1.5—1.6 mm. Spines in 5 longitudinal rows and a slanting quincunx. Length 60 μ; mutual distance 270 μ.

One of the specimens of station 144 is a fragment, branched on all sides, with the branches always nearly at right angles with the branch of lower order. The branches are somewhat curved, sometimes changing of direction at an obtuse angle. The mutual distance of the branches is a few mm. to 1 cm. and more. The spines (fig. 46*a*) are smooth, triangular and at right angles with the axis or somewhat inclined. The spines on opposite sides of the axis differ in length and sometimes one side of the axis is nearly smooth; the longest spines do not coincide precisely with the polyp-bearing side of the axis. — There are 6 longitudinal rows, sometimes forming a quincunx, but usually showing a great variability in the mutual distance of the spines, and also in the course of the rows itself. On an average the mutual distance is 225 μ and their length 60 μ. — The polyps (fig. 46*b*) are inserted in a single row, without giving preference to a special side of the colony. The oral cone is low with a small round mouth. The length of the sagittal tentacles is 0.35 mm., of the lateral ones 0.3 mm. The intertentacular distance is 1.25—1.5 mm. — Here and there a very large polyp appears (fig. 46*b*, at the base of the branch), just as is described in other specimens. The spines are visible only through the coenenchyma.

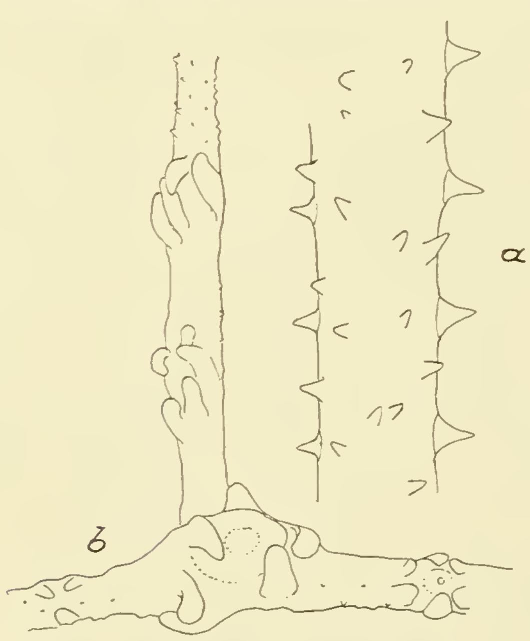

Fig. 46. *Euantipathes dichotoma* (Pall.) n. n. *a* Spines; *b* polyps; *a* 52 ×; *b* 14 ×.

The second specimen is a complete colony, 4 cm. in height. The stem is curved and

sinuous, especially near the base, but strong and upright as the first specimen. All branches lie nearly in the same plane. The length of the branches is a few mm. to upwards of 3 cm.; their mutual distance is 3 mm. Secondary branches of 1 cm. occur. The branches are never at right angles with the supporting branch, but otherwise the angle is very variable. The basal diameter (275 μ.) shows no further increase. — The spines (fig. 47*a*) are arranged in 6 longitudinal rows and a straight quincunx. Their shape is triangular and of a heavier build than in one of the former specimens. Their mutual distance is 300 μ. (270 μ. to 330 μ., but always the same in a special part of the colony, so that the quincunx is not shifted). The length of the smooth spines is 65 μ. — The only subsisting three polyps (fig. 47*b*) have an intertentacular distance of 1.25 mm. and a tentacular length of 0.35 mm.

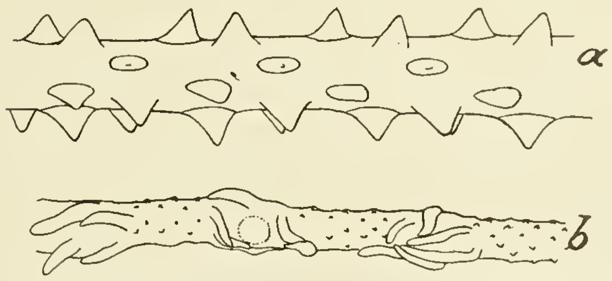

Fig. 47. *Euantipathes dichotoma* (Pall.) n. n. *a* Spines; *b* polyps; *a* 52 ×; *b* 14 ×.

It seems that the proximal lateral tentacles are somewhat larger than the distal ones; there is hardly any oral cone; a part of the polyp (in fig. 47*b* indicated by a dotted line) is somewhat thicker and more opaque than the rest of the polyp. — The spines show through the transparent white coenenchyma, but not through the polyps.

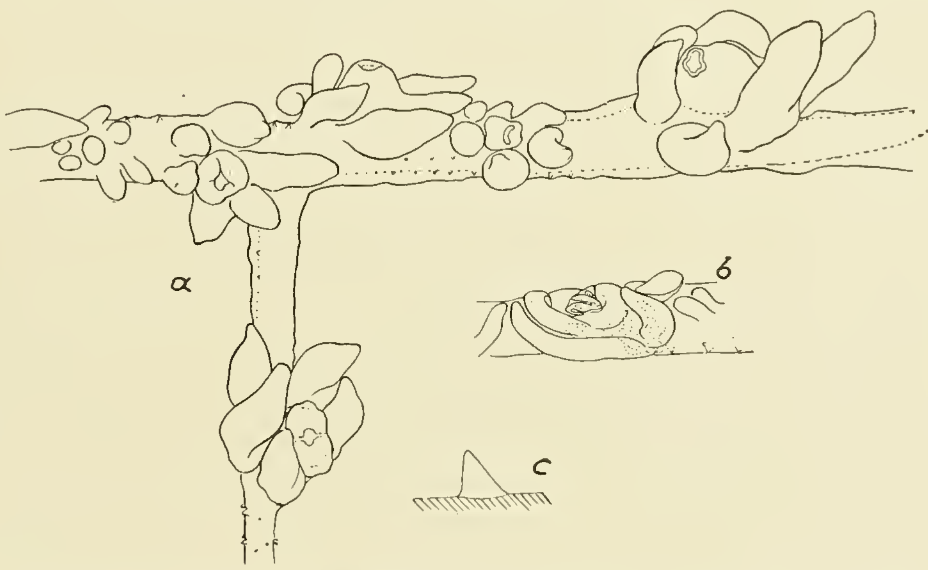

Fig. 48. *Euantipathes dichotoma* (Pall.) n. n. *a* Polyps; *b* polyp with mesenterial filaments visible at the mouth and through the bodywall; *c* spine; *a*, *b* 14 ×; *c* 52 ×.

From the seven specimens of station 250 I will first describe two, one of which is unbranched, so that, if I were not in the possession of branched specimens, I would have described it as a *Stichopathes*. The unbranched colony is 3 cm. in length and curved, with a basal diameter of 180 μ., diminishing regularly. The branched colony has a stem of 4 cm., curved and bearing 4 branches on its concave side 1.5—2.75 cm. in length, not in the same plane, and at right angles with the stem or at an angle of 75°—90°. The basal diameter of the stem is 330 μ. and diminishes regularly. The smooth spines (fig. 48*c*) are triangular with their distal side at right angles with the axis. Their length is 90 μ., subequal on all sides of the axis; their mutual distance is 240 μ.; there are 4 longitudinal rows alternating quincunxially; sometimes two rows stand on the same or nearly the same level. The polyps (figs 48, 49) are very large and conspicuous, but their dimensions are very unequal (fig. 48*a*). They are not inserted on

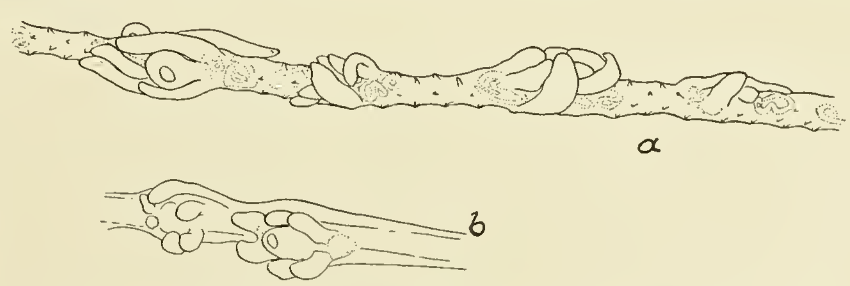

Fig. 49. *Euantipathes dichotoma* (Pall.) n. n. *a*, *b* Polyps with visible mesenterial filaments (*a*); *a*, *b* 14 ×.

a special side of the colony, but always in a single series, except on the base of the branched colony, where a few irregularities occur. The intertentacular distance is 1.25—1.5 mm.; young polyps are interpolated between the adult ones, but without alternating regularly. The distal pair of lateral tentacles is much shorter than the proximal ones; the distal ones are 0.4 mm. in length, the proximal ones 0.65 mm., the sagittal ones 0.75 mm. or in all demensions larger or smaller in the same proportion. The oral cone is very large and swollen with a rounded mouth, which in one case I found sagittally elongated (fig. 48*a*). The entire surface of the polyps and the coenenchyma is covered with warts. — The mesenterial filaments are so blackened by darkbrown pigment as to be clearly visible in all polyps, especially in the unbranched colony (figs. 48*c*, 49). Sometimes they form a black mass, filling the entire polyp, even the tentacular lumen, and in fig. 48*c* is shown how they may be visible in the oral orifice. On the unbranched colony the polyps have the same shape (fig. 49*b*), but after a transition zone the shape of fig. 49*a* appears, which is more in accordance with the polyps of the other 5 specimens. Both colonies are much stronger than the specimens of the preceding stations; the specimens of station 204 and 302 form a transition towards the more slender specimens.

The other 5 specimens of station Kur have the same structure as the specimen of the following station 79*a*, except that the branching takes place in all directions and that the polyps are a little slimmer, while the oral cone is better developed, with a small round mouth.

The specimen of station 79*a* is branched in a plane, and all its branches are at right angles with the stem, on irregular distances one from the other. They are curved and sinuous, thin and elongate (3—8 cm.). The secondary branches, also at right angles, are 1—7 cm. in length, according to the length of the branch which bears them. They spread in every direction, and are slender and curved; their mutual distance is very variable, but there are only 2 or 3 on a single branch. Some tertiary branches occur. The spines (fig. 50) are at right angles with the axis; usually the distal side is steeper than the proximal side. There are 4 longit. rows and a quincunx. Sometimes the spines are doubled, that is to say two spines are very close together, neither of them on the exact place of the spine they represent. The surface of the spines is smooth; length 60 μ., subequal on all sides of the axis; mutual distance 285 μ. The polyps (figs 51, 52) are placed in a single series but not on a special side of the colony. They are very transparent; as white warts they are visible on the axis. Their intertentacular distance is ± 1.5 mm. All tentacles are subequal in length viz. 450 μ. However there are polyps the proximal lateral tentacles of which predominate, but quite near there are also polyps the distal lateral tentacles of which predominate! The sagittal tentacles are inserted at a lower level than the lateral ones. The oral cone is low; the mouth is not well visible. Between the polyps a

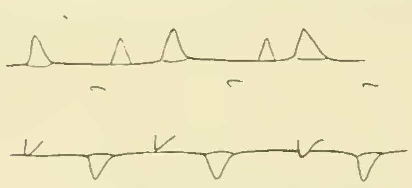

Fig. 50. *Euantipathes dichotoma* (Pall.) n. n. Spines; 52 ×.

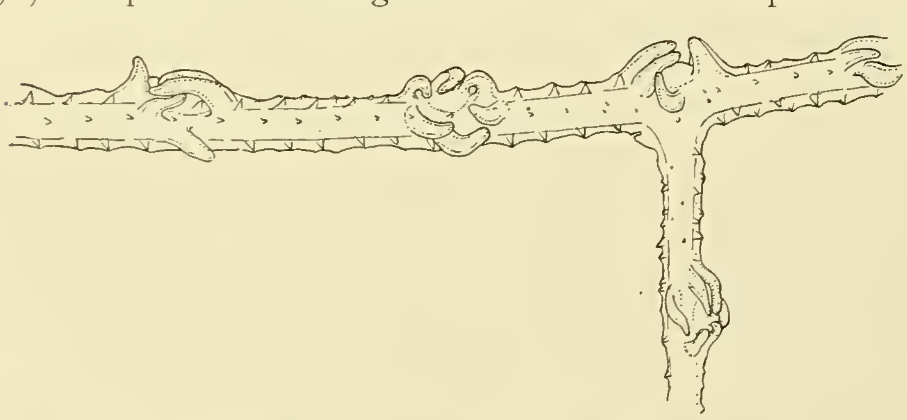

Fig. 51. *Euantipathes dichotoma* (Pall.) n. n. Polyps; 14 ×.

cross-groove occurs. Between the adult polyps young ones are to be found, alternating rather regularly in some places (fig. 52). On the thinner parts of the axis the polyps are somewhat transversally elongated. The spines are visible through the coenenchyma, and sometimes even through the oral cone. This specimen, nearly related to *Antipathes mediterranea* Br., differs chiefly in the lower number of rows of spines and a lesser distance between the polyps.

Fig. 52. *Euantipathes dichotoma* (Pall.) n. n. Polyps; 11.5 ×.

The complete colony of station 257 has a basal plate with a diameter of 2 mm. The stem (4 cm.) is straight or irregularly sinuous and tapers regularly. The branches are curved and bear secondary branches at irregular interspaces. The fork-angles are 45°—60° but never 90°. For the greater part the branches are lying in a plane with rare exceptions. The spines are the same as in fig. 48*c*; they are very sparingly inserted near the base of the stem and on the base itself they are entirely absent. On the other parts there are 4(—5) longitudinal rows, alternating rather regularly in a quincunx. They are subequal in length (75 μ) on all sides of the axis. Their mutual distance is 360 μ, but this value is variable. The polyps (fig. 53) are greyish brown and placed in a single row. Young and adult polyps alternate, sometimes very regularly; the cross-groove between the polyps is clearly visible. The sagittal tentacles are inserted on a lower level than the lateral ones. With some polyps the oral cone is entirely flattened and in collaps. The spines perforate the young polyps at the utmost. The intertentacular distance is 1.25—1.5 mm. The length of the tentacles is 0.25 mm. (sometimes the sagittal ones are less). The mouth, often not clearly visible, is small and rounded (fig. 53*b*). A near relationship between this specimen and *Antipathes aenea* v. Koch is not to be doubted, only in structure of the polyps there are differences, while the length and the distance of the spines in *A. aenea* v. K. are greater. In character of the spines it is nearer related to *Antipathes furcata* Gray (emend. Sch.).

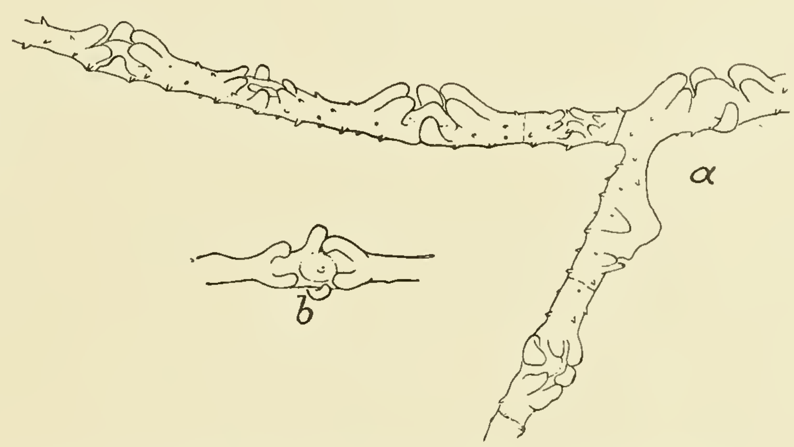

Fig. 53. *Euantipathes dichotoma* (Pall.) n. n. *a* Polyps; *b* polyp with biserial arrangement of the tentacles; *a*, *b* 14 ×.

The colony of station 164 is 27 cm. in height, slightly curved, rather brittle, and densely branched. The broken stem is 1.5 cm. long (diameter 2.5 mm.). The branches lie almost in the same plane, and they are inserted at angles of 30°, except in one case of 45°. The branches are curved, sometimes to a high degree. The ultimate branches (of the 4th order) have a length of one to several cm., and in their top-part they are sub-parallel with the stem. The diameter of stem and branches

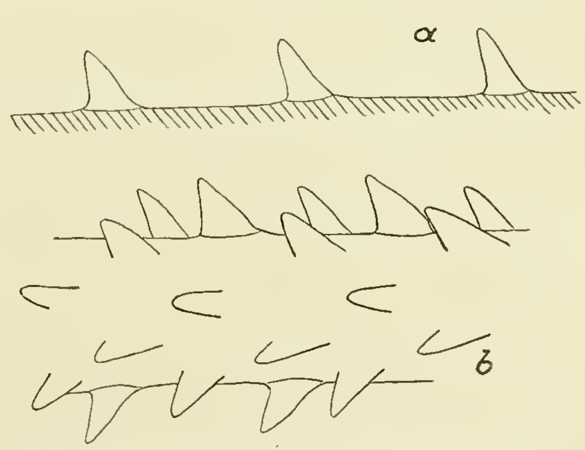

Fig. 54. *Euantipathes dichotoma* (Pall.) n. n. *a* Spines on younger branches; *b* Spines on an older branch; *a*, *b* 52 ×.

diminishes regularly. The spines (fig. 54) are arranged in 6 longitudinal rows, alternating in a quincunx. Their surface is smooth and on the younger parts (fig. 54*a*) their shape is more slender than on the older parts of the colony (fig. 54*b*). Their mutual distance is 375 μ and their length is the same on all sides of the axis: 150 μ. They are visible through the coenenchyma and the periphery of the polyps. The polyps (fig. 55, 56, 57) are visible to the naked eye as white cushions, placed in a single series, but not on a special side of the axis; often the line of polyps is wound round the axis, and on the older parts some polyps deviate from the single row. Polyps and coenenchyma are very transparent. The sagittal tentacles are inserted at a slightly lower level and the proximal lateral ones are larger than the distal ones; the base of the tentacles is swollen, the top is more slender. Length of the sagittal tentacles 0.55 mm., of the proximal lateral ones 0.85 mm., of the distal lateral ones 0.55 mm. The intertentacular distance is 1.4 mm., and there is a cross-groove between the polyps and a clearly visible straight longitudinal groove on the back of the axis. Young polyps alternate rather regularly with the adult ones. Colour: white or greyish. The oral cone is low, with a small round mouth. Usually the oral cone is invisible while the tentacles are covering it. — Coenenchyma and polyps show little milkwhite spots. The darkbrown mesenterial filaments are very conspicuous in all polyps.

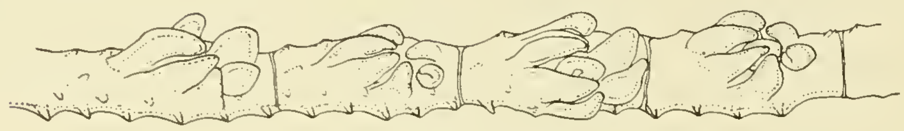

Fig. 55. *Euantipathes dichotoma* (Pall.) n. n. Polyps: 14 ×.

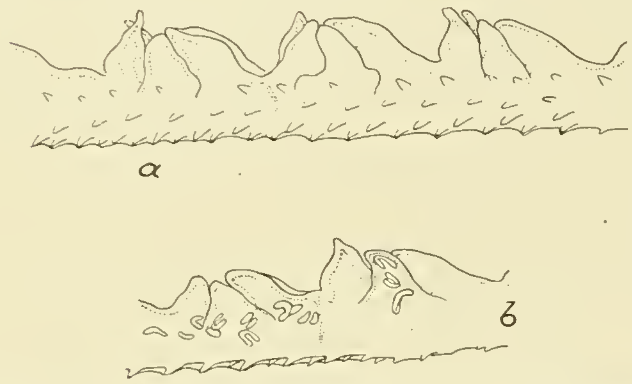

Fig. 56. *Euantipathes dichotoma* (Pall.) n. n. *a*, *b* Polyps; *a*, *b* 14 ×.

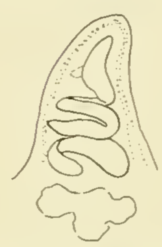

Fig. 57. *Euantipathes dichotoma* (Pall.) n. n. Tentacle filled with mesenterial filaments; 52 ×.

The complete colony of station 310 is 10.5 cm. in height; the diameter of 825 μ at the base remains subequal; at the top a swift tapering takes place. The same holds true for the branches. The slightly sinuous stem bears two rows of branches, both in the same plane, alternating regularly to the right and to the left, with a varying mutual distance of 1—2 cm. in a row. The angle of insertion is 30° and the branches are on their further course curved distally, till they are subparallel with the stem. The secondary branches are inserted at the same angle and have the same course, but they are inserted only on the convex side of the primary branches. The same holds true for the branches of the 3[rd] and the 4[th] order; all branches lie almost in the same plane. The spines (fig. 58*b*) are blunt, triangular, with their distal side at right angles with the axis, smooth or slightly rough with irregular grooves. The length

Fig 58. *Euantipathes dichotoma* (Pall.) n. n. *a* Spines on the base of the colony; *b* spines on a branch; *a*, *b* 52 ×.

of the spines is 155 μ and 120 μ on opposite sides of the axis; there are 5 longitudinal rows, alternating in a quincunx, with a mutual distance of 300 μ. — The base of the colony (fig. 58*a*) is on one side nearly smooth; the other side has spines of 165 μ; mutual distance 245 μ in the 4 (—5) longitudinal rows; they are more upright than on the other parts. The polyps (figs. 59, 60, 61) are very transparent (fig. 60), so that BROOK's *Aphanipathes*-character is more conspicuous than would be the case when the polyps were more opaque (fig. 59). They are placed in a single series on the frontside of the colony; sometimes they are somewhat shifted. The tentacles are overlying the oral cone, which in this manner is inconspicuous. The sagittal tentacles are inserted at nearly the same level as the lateral ones; their length is subequal (0.35—0.5 mm.). The interpolypar distance is 1.6 mm. at the utmost. The transversal groove is often visible; some young polyps occur between the adult ones. The longitudinal groove at the back of the axis broadens very much towards the top of the branches (fig. 61). — The following specimens are entirely or nearly without polyps:

Fig. 59. *Euantipathes dichotoma* (Pall.) n. n. Polyps; 14 ×.

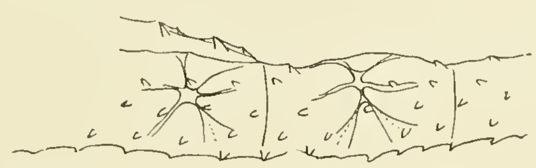

Fig. 60. *Euantipathes dichotoma* (Pall.) n. n. Polyps; 14 ×.

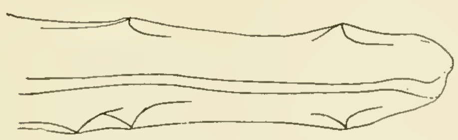

Fig. 61. *Euantipathes dichotoma* (Pall.) n. n. Top of a branch with longitudinal groove; 52 ×.

Station 240. Complete slender colony. Stem 3.5 cm., curved in a half-circle; 12 straight branches, all at right angles with the axis, not in a plane; length ± 1 cm. (max. 2 cm.). Secondary branches ditto; length a few mm. to 0.5 cm. Spines: 5 rows and quincunx; distance 330 μ to 390 μ; length 70 μ; shape fig. 47*a*, but the distal side is concave and at right angles with the axis. The polyp-remains are of the type of station 184; the interpolypar distance is 1.25 mm.; young polyps occur between the adult ones. — Station 305. A rather strong colony; straight stem; branches on all sides; secondary branches principally in a plane. All branches curved or sinuous. Ultimate branches 3—5 mm. Rare fusions occur between the primary branches. Angle 60° to nearly 90°. Mutual distance 1—6 mm. Spines as fig. 50; length 50 μ on all sides; distance 180 μ; 5 longitudinal rows. A large part of the colony is enveloped in a sponge-tissue with many spiculae; in the cavity, formed by this tissue, shut on all sides, sits a colourless Decapod. The mode of branching is on first view not so very like that of the other colonies, since the shape of the colony, especially its marked thickness, forms a transition towards the former genus *Arachnopathes*. — Station 119. Irregularly curved stem of 5 cm. Branches at angles of 45° to 90°, on all sides; length 1—5 cm., curved. Straight secondary branches of 5 mm., nearly at right angles with variable distance. Diameter of stem is 0.5 mm. and diminishes regularly. The entire colony is very much like that of station 305 minus the fusions. Spines as fig. 50, but at right angles with the axis; length 85 μ, distance 330 μ; 6 (—7) longitudinal rows and a slanting quincunx. — Station 80. Two specimens, one branched in a plane, the other one not. In one specimen the

angles are 90°, in the other one nearly 90°. Length of branches 0.5—4.5 cm.; mutual distance a few mm. to 1 cm. Spines 60 μ, at a distance of 330 μ; 5 longitudinal rows and straight quincunx; form as fig. 47*a*. Polyp-remains very low; tentacles in three pairs. Interpolypar distance 1.5—1.75 mm.; length of tentacles sometimes 1.3 mm., but usually shorter. — Station 95. Irregularly curved stem of 6 cm., regularly tapering; 7 straight or slightly curved branches at variable distances ($\pm$ 0.5 cm.), 1.5 cm. in length, and at an angle of 60° to 90°, not lying in a plane. Spines ditto as in fig. 47*a*, but with concave sides; length 45 μ; distance $\pm$ 195 μ; 5 longitudinal rows with a quincunx here and there. Spines sometimes doubled or irregularly shaped.

In the tabel opposite this page I have put together all described specimens and the species, which I would identify with them and with Pallas' *Antipathes dichotoma*, as far as I could give numerical data with the help of former descriptions and figures. The letters added to the station-numbers in the first column indicate the specimens in their order of description. While the review of characters could be complete for the Siboga-specimens, this was not always possible for the formerly described species, as either the text, or the figures left smaller or larger gaps in the descriptions. As far as possible I have deduced the characters and the numerical data from the text as well as from the figures, both of which methods did not always give the same results: often only approximately computed values could be given through defective figures, the missing of the enlargements-data, or because of a vague text. Now already I will point out that most species are represented by some fragmentary colonies only, often without polyps even, and that only very rarely complete colonies were available as a base of the descriptions, and moreover only one single specimen in most cases (cf. the former habitat. following the diagnosis furtheron, where the number of colonies is given for each species, between brackets). In the case of the Siboga-material, in some cases two or even more complete colonies were available. To simplify the review I am going to give, the various species and stations are indicated by their roman ciphers.

Number of longitudinal rows of spines. In most cases these rows are 4 in number. The deviations, which occur, are the following:

4—5 rows by XII; XIVβ; XVII; XX; XXIX; XXXII.

5 rows by II; III; VII; VIII; XV; XVI; XIX; XXIβ; XXII; XXIII; XXIV; XXXVI; XXXVII.

5—6 rows by XXIα; XXVIII; XXXVII.

6 rows by X; XI; XXV.

6—7 rows by IX; XXVII.

These deviations are not very great, especially if one bears in mind that the number of rows increases on the older parts of the colony, as is demonstrated by various Siboga-specimens and as some authors emphatically mention in their descriptions. Much more than six rows do not occur. The large number of species with 5 rows might be explained by the fact that the authors perhaps gave the middle value of the number of rows on different parts of the axis (this is not the case in the Siboga-specimens with 5 rows), or by also counting the rows of spines the bases of which were invisible from one side of the axis while their tops were visible.

STATION or SPECIES	long. rows and quincunx (s. = straight, sl. = slanting)	length of spines in μ	distance of spines in μ	shape of spines	polyps in a single series	polyps on one side of the colony	length of tentacles in mm.	prox. lat. t. predominate	oral cone	mouth	inter-polypar distance in mm.	isolated very large polyps	firmness of the colony	angle between branches and bearing branch	diameter increases above the base	distance of branches	length of branches	shape of branches	REMARKS
I. 7	4 s. q.	60	240	fig. 31 *a* distal side concave	yes	yes	p. l. 0.3 d. l. 0.175 s. 0.45	yes	large and swollen	small and round	1.5	no	very slender	45°	yes	2.5 cm.	2—11 cm.	sinuous	branches curved in a direction opposite to that of the branch of lower order.
II. 47	5 s. or sl. q.	50	345	fig. 31 *a* basis elongate	?	?	?	?	?	?	?	?	very slender	45°(—35°)	yes	up to 3 cm.	up to 9 cm.	parts of a circle	
III. 50	5 sl. q.	60	270	as I	yes	yes	p. l. 0.3 d. l. 0.175 s. 0.45	yes	large and swollen	small and round	1.5—1.6	no	very slender	45°—60°	yes	2.5 cm.	2—11 cm.	sinuous	
IV. 250	4 s. q.	90	240	fig. 51 *a*	yes 1)	no	p. l. 0.65 d. l. 0.4 s. 0.75	yes	large and swollen	round or sagittally elongated	1.25—1.5	polyps unequal	firm	90° or 75°—90°	no	a few mm.	1.5—2.75 cm.	curved	branches only on the concave side of the stem; one colony is unbranched. 1) except on the base of the colony.
V. 64	4 s. or sl. q.	30	300	fig. 31 *a*	yes	no	0.3—0.375	no 1)	low	small and round	1.6	no	slender and weak	45° (once: 90°)	no	1.75 cm.	8—9 cm.	sinuous	1) or very little.
VI. 79a	4 q.	60	285	fig. 31 *a*	yes	no	0.45	yes	middling size or low	small and round	1.5	no	slender	90°	no	± 1 cm.	3—8 cm. (1—7)	curved and sinuous	polyps very transparent; sometimes dist. lat. t. predominant.
VII. 80	5 q.	60	330	fig. 31 *a* at right angles	?	?	1.3	?	?	?	1.5—1.75	?	firm	90° or nearly 90°	no	a few mm.—1 cm.	0.5—4.5 cm.	straight or sinuous	one colony in a plane, the other one not: tentacles in three pairs.
VIII. 95	5 q. or irr.	45	195	fig. 31 *a* at right angles	?	?	?	?	?	?	?	?	slender	60°—90°	no	± 0.5 cm.	± 1.5 cm.	straight or slightly curved	branches on all sides; sometimes doubled spines; surface of spines sometimes finely granulated.
IX. 119	6(—7) sl. q.	85	330	fig. 31 *a* at right angles	?	?	?	?	?	?	?	?	firm	45°—90°	no	1.5—3 mm.	0.5—5 cm.	sinuous	branches on all sides.
X. 144	6 s. q.	60—65	225—330	fig. 31 *a* sharp 1)	yes	no	s. 0.35 l. 0.3	somewhat	low	small and round	1.25—1.5	yes	firm	α 90° β varies but never 90°	no	3 mm.—1 cm.	a few mm.—2 cm.	curved or sinuous	one colony is branched nearly in a plane. 1) on one colony heavily built.
XI. 164	6 q.	150	375	fig. 58	yes	no	p. l. 0.85 d. l. 0.55 s. 0.55	yes	low	small and round	1.4	no	firm	30°(—45°)	no?	some cm.	1—several cm.	curved	polyps very transparent.
XII. 184	4(—5) s. or sl. q.	45 and 80	350	fig. 44	yes	no	0.45	very slightly	large and swollen	small and round	2 or sl. less	no	very thin and slender	45° or 30°—45°	no	3 mm.—5 cm.	a few mm.—7 cm.	curved	oral cone somewhat transversally elongated; parasitical bubbles in the body-wall.
XIII. 193	4 sl. q.	50	300	fig. 31 *a* basis elongated	yes	no	p. l. 0.55 d. l. 0.225 s. 0.35—0.4	α yes β no	large; concave sides	transversally elongated	0.75—1.5 or 2	yes	very thin and slender	45°	no	± 3 cm.	3—8 cm.	sinuous	β has parasitical bubbles.
XIV. 204	4(—5) s. q.	45	240	fig. 31 *a*: at right angles to the axis	yes	no	p. l. 0.3 d. l. 0.175 s. 0.45	yes	large and swollen	small and round	1.25	no	slender and rather firm	45° or 60°	α yes β no	2.5 cm.	2—11 cm.	sinuous	branch curved towards the stem.
XV. 213	5 s. q.	60	300	fig. 31 *a* basis elongated	yes	no	p. l. 0.18 d. l. 0.135 s. 0.15	slightly	large; concave sides	small and round	1.75—2	no	very thin and slender	α 30° and 90° β 45° or slightly less	no	2.5 cm.	1—18 cm.	curved	branch-tops subparallel with the stem.
XVI. 240	5 q.	70	330—350	fig. 31 *a*	yes	?	0.45	very slightly	large and swollen	small and round	1.25	?	slender	90°	no	2—4 mm.	a few mm.—2 cm.	straight	stem is a half-circle; branches in all directions.
XVII. 257	4—5 q.	75	360	fig. 51	yes	yes	0.25	no	middling size or low	small and round	1.25—1.5	no	rather firm	45°—60°	no	2—5 mm.	3 mm.—1.25 cm.	curved	
XVIII. 302	4 sl. q.	50	300	fig. 31 *a*	yes	no	p. l. 0.55 d. l. 0.225 s. 0.35—0.4	yes	large and swollen	transversally elongated	1.9	yes	rather firm	30°—45°	no	1—3 cm.	1—15 cm.	slightly sinuous	
XIX. 305	5 q.	50	180	fig. 31 *a*	?	?	?	?	?	?	?	?	firm	60°—90°	no	1—6 mm.	3—5 mm.	curved or sinuous	branches on all sides; secondary branches in a plane. — Rare fusions.
XX. 310	(4—)5 q.	120 and 155	245—300	fig. 62	yes	yes	0.35—0.5	no	middling size	small and round	1.6	no	firm	30°	no	1—2 cm.	up to 9 cm.	curved	polyps very transparent.
XXI. 313	5—6 s. q.	35 or 45	225—360	fig. 31 *a*	yes	no	p. l. 0.525 d. l. 0.26 s. 0.3	slightly	large; concave sides	small and round	1.25—1.5	no	very thin and slender	60° or 30°	α no β yes	1)	up to 10 cm.	parts of a circle	parasitic bubbles in the body-wall. 1) number of branches is too small.
XXII. *Antipathes dichotoma* Pall.	5 q.	130	570	fig. 31 *a* distal side concave	yes	no	s. 2.25 l. 1.25	no	large and swollen	sagittally elongated	2.5 (?)	no	thin and slender	almost 90° or slightly less	?	1 cm.—some cm.	4—16 cm.	curved	branches are curved towards the stem.
XXIII. *Litophyte* No 9. *Marsigli*	5 (?)	?	?	sharp triangular; distally inclined	2 (?)	?	?	?	large and swollen (?)	?	1.5 (?)		firm and slender	45°—almost 90°	no	2—3 cm.	3 cm.	sinuous	polyps are contractile.
XXIV. *Antipathes arborea* Dana	5 (?) no q.	150	1000	fig. 31 *a* or concave distal side	yes	no	?	no	large and swollen	?		no	firm	30 almost 90°	?	a few mm. (?)	3 cm.	sinuous	
XXV. *Antipathes virgata* Esp. (*A. scoparia* Lam.)	6 s. or sl. q.	150	300—335	fig. 31 *a* sometimes granulated	yes	no	?	?	?		2.5		firm	acute (30°—45°)	no	up to 2 cm. (?)	15—50 cm.	curved	polyps large; branches are curved towards the stem; sometimes fusions; in one case the branches are inserted unilaterally.
XXVI. *Antipathes? lentipinna* Brook	(5)—6 q.	150	375	fig. 31 *a* acute	?	?	?	?			?	?	firm (?)	acute (30°—45°)	?	4—10 cm.	8—15 cm.	curved	branches usually inserted unilaterally. difference in diameter between branches and branchlets.
XXVII. *Antipathes? mediterranea* Brook	6—7 no q.	150	750	fig. 31 *a* concave distal side	?	?		?	?	?	?	?	firm (?)	90° (sometimes acute)	?	4—9 cm.	?	sinuous or straight	one fusion occurs.
XXVIII. *Antipathes furcata* Gray (diagnosis: Sch.)	5—6 no q.	70	210—280	fig. 31 *a* acute	?		?	?	?	?	?		slender	(30°—)45° rarely 90° or obtuse	?	1—2 cm.	up to 9 cm.	curved	branches often unilaterally inserted. BROOK)
XXIX. *A. furc.* var. α Sch.	4(—5) sl. q.	60	± 300	fig. 31 *a* concave distal side at right a. with the axis	yes	yes	p. l. 0.375 d. l. 0.2 s. 0.25	yes	large and swollen	sagittally elongated	over 1	?	slender	(30°—)45° rarely 90° or obtuse		1—2 cm.	up to 9 cm.	curved	
XXX. *A. furc.* var. β Sch.	4 s. q.	60	400	fig. 31 *a*, concave distal side at right a. with the axis	yes	no	p. l. 0.75 d. l. 0.45 s. 0.75	yes (some)	large and swollen	round	over 1	?	slender	(30°—)45 rarely 90° or obtuse	?	1—2 cm.	up to 9 cm.	curved	
XXXI. *Antipathes aenea* v. K.	4 q.	100—200	600—700	fig. 31 *a* elongated base	yes	no (?)	s. 4. p. l. 4 d. l. 2.5	yes	high; rather large	sagittally elongated (?)	3	no	rather firm	60°	?	a few mm.—3 cm.	a few mm.—20 cm.	curved	branches usually on the convex side of the branch of lower order; fusions occur.
XXXII. *Antipathes gracilis* v. K.	4(—5) 1) sl. q.	50—100	400	fig. 31 *a*	yes	no	s. 0.6 p. l. 0.9 d. l. 0.75	slightly	middling [illegible]	sagittally elongated (?)	1.4	no	[illegible]	45° [illegible]		8 mm.—3 cm.	1—[illegible] cm.	sinuous	1) seven longitudinal rows on the older parts.
XXXIII. *Antipathes viminalis* L. Roule	4 q.	150—200	450	fig. 31 *a* acute	yes	no	s. 1.5—2 l. 0.75—1	no	small, low	round (slightly sagittally elongated)	3	no	slender and thin	60°—90°	no	a few mm.—over 2 cm.	5—11 cm. (or over)	sinuous	red polyps.
XXXIV. *Antipathella gracilis* Gray	5 q.	80—150	1000	fig. 31 *a*	yes	no	s. 1 p. l. 1 d. l. 0.75	slightly	low	round (slightly sagittally elongated)	1.5—2	no	slender	to 45° (sometimes 90°) (30°—40°) 1)	no	1—3 cm.	1—11 cm.	curved and sinuous	oral cone transversally elongated. 1) (30°—40°) after JOHNSON.
XXXV. *Antipathella Brooki* Johnson	4 q.	60	230	fig. 31 *a* acute	?		?	?	?	?	?	?	slender and thin	forked (?)	?	?	1.5—10 cm.	curved	frequent fusions; in a part of the colony the branches are inserted unilaterally.
XXXVI. *Antipathella elegans* T. and S.	5	?	?	fig. 31 *a* distal side at right a. with the axis	yes	no	?	?	large and swollen	round	?	no	slender	?	?	?		?	dimensions can not be given, since the enlargement is not mentioned.
XXXVII. *Paratylopathes atlantica* L. Roule	4 q.	60—80	100—120	fig. 31 *a*	yes	no	s. 1 l. 0.8	no	large and round	?	3—3.5	no	rather firm; branches slender	30°—45°	no	a few mm.—4 cm.	1—15 cm.	curved	
XXXVIII. *Paratylopathes Grayi* L. Roule	4 q.	40—80	100	fig. 31 *a*	yes	no	s. 1 l. 0.7	slightly	?	?	?	no	slender	45°—90°	no (?)	1—2 cm.	3—5 cm.	curved	greatest part of the branches in a plane.
XXXIX. *Antipathes grandiflora* Silberfeld		92	300—400 (?)	obtuse or acute; at right a. with the axis	yes	no	?	?	?	?	1.5	? 1)	rather firm	90° or almost 90°	?	± 0.5 cm.	3.5 cm.	curved	Plps. are very much like *A. arborea* Dana; also very much like *P. atlantica* R. 1) high and low polyps.
XL. *Antipathes pseudodichotoma* Silberfeld	5—6	128	± 300	distal side at right a. with the axis	yes	no	?	?	?	?	1—1.5	?	rather firm	30°	?	1.5—3 cm. (?)	3—11 cm.	somewhat curved or straight	branches inserted unilaterally.

L e n g t h o f t h e s p i n e s. This value, which is one of the least useful of the former specific characters, varies in a high degree round 60 μ (30—80 μ). Very large deviations occur as follows:

90 μ IV; 80—150 μ XXXVII; 120—155 μ XX; 100—200 μ XXXIV; 150 μ XI, XXIII, XXIV, XXV, XXVI, XXVII; 150—200 μ XXXIII.

A sharply defined limit is nowhere to be observed and it would be an arbitrary proceeding to decree that with some ten μ more or less a new species appears.

S h a p e o f t h e s p i n e s. Here also the differences, which may occur, are very slight. The shape, which is the most frequent, is as follows: triangular, with the distal side somewhat steeper than the proximal side; a smooth surface; inserted at right angles with the axis. Small deviations may occur, viz. a more acute top; an elongated base; distal side more at right angles with the axis; the entire spine more distally inclined. Of greater importance are the more heavily built spines of X β and especially of IV α and β, and XX; a granulated surface is present in VIII and XXV. However these differences are not very large and neither of them are of specific value, especially if one keeps in mind the very great variability of these characteristics in *Stichopathes*-species, where I could examine them closer.

M u t u a l d i s t a n c e o f t h e s p i n e s. This value, which already is very variable, from 210 μ—375 μ with all possible transitions, shows the following larger deviations:

400 μ: XXX and XXXII; 450 μ: XXXIII; 570 μ: XXIII; 600—700 μ: XXXIV; 750 μ: XXVII; 1000 μ: XXIV (old branch) and XXXVII.

A diminished value show: 195 μ: VIII; 180 μ: XIX; 100 μ: XXXV and XXXVIII.

Very large leaps occur only from 800—1000 μ, although it is not impossible that in XXIV on younger branches the spines are more crowded; at all events this difference is less than the individual variability in various cases.

D i s t r i b u t i o n o f t h e p o l y p s. In this respect there are only very slight differences. The polyps are always inserted in a single series; very slight deviations of this rule occur only in IV (on the oldest part of the colony), X and XXIV. In five cases the polyps are inserted on one special side of the colony; in 22 cases there is no preference for a special side.

D i m e n s i o n s o f t h e p o l y p s. This value, which obviously is very dependent on the preservation of the polyps, is unequal for nearly every described specimen. Very great deviations I find by XXIII, while the demensions of XXXIII, XXXV, XXXVII and XXXVIII form an almost imperceptible change towards the normal middle value.

D i f f e r e n c e b e t w e e n t h e p r o x i m a l a n d d i s t a l p a i r s o f l a t e r a l t e n t a c l e s. This difference may be observed in greater or lesser degree in nearly all polypbearing specimens. It is small but clearly visible in I, XII, XV, XXI, XXXII, XXXIV, XXXV and XXXVII, while the difference is entirely absent in V (or very slight) XIII β (α shows a great difference!) XVII, XX, XXIII, XXIV, XXX (except in some polyps), XXXIII, XXXVIII. The remarks between brackets show already that only in a few cases an entire equality appears; the case of XIII α and β shows besides how nearly related specimens, found in the same locality and otherwise entirely alike, are very different in this respect without allowing a specific difference. — Besides the degree of predomination of the proximal lateral tentacles is very

variable in one and the same specimen, as is demonstrated by the descriptions and the figures.

Oral cone. Herein there are three cases to be discriminated, one of which however (oral cone with concave sides) is possibly a special condition of preservation of the first case.

large and swollen: I, III, IV, XII, XIV, XVI, XVIII, XXII, XXIII, XXIV, XXIX, XXX, XXXIV, XXXVI, XXXVIII; (VI, XVII, XX and XXXII are of middle size).

large, with concave sides: XIII, XV, XXI.

low: V, X, XI, XXXIII, XXXVII.

If the second group is added to the first, the majority of the specimens has a large oral cone, while only a few have a low cone; XXXII can serve as a transition between them, besides counting the fact that in one and the same colony the oral cone is not equally conspicuous in all the polyps.

Mouth. The shape of the mouth can be as follows:

round: I, III, V, VI, X, XI, XII(?) XIV, XV, XVII, XXI, XXX, XXXVI.

round or sagittally elongated: IV, XXXIII (somewhat), XXXVII.

sagitally elongated: XXIII, XXIX, XXXII(?), XXXIV(?).

transversally elongated: XIII, XVIII.

In the other cases the shape of the mouth was not to be made out. — As a rule we may say that the mouth is small and round, or somewhat sagittally elongated. — The transversal elongation of XIII and XVIII (a type, which does not greatly differ from V, which has a round mouth) is not practicable for specific differences because the shape of the mouth is not very stable, as was hardly to be expected through the different states of preservation.

Interpolypar distance. It is not to be denied that very large oscillations occur in this respect, but I must say that many of the greater distances are derived from descriptions, which gave this distance only in a very arbitrary manner. If besides one keeps in mind that in many cases young polyps alternate (sometimes rather regularly) with the adult ones, so that the interpolypar distance increases while the young polyps are at the same time still too small to be seen on a superficial inspection, and even entirely invisible when the preservation is bad, it is easy to conceive that in some cases the distance is given nearly twice too large. To this should be added that the numerical data of the authors not always agree; e. g. von Koch gives as interpolypar distance of *Antipathes glaberrima* 1.75 mm. while from Brook's figures can be deduced 2.5 mm. Such may also have been the matter in the descriptions of the here-discussed species.

The distance varies round a middle-value of 1.5 mm. in I, III, IV, V, VI, VII, X, XI, XIII α, XIV, XVI, XVII, XX, XXI, XXII, XXXII, XXXVII.

Somewhat larger deviations are:

1.9 mm.: XVIII; 1.75—2 mm.: XV; to 2 mm.: XII, XIII β, XXXV, 2.5 mm.: *Antipathes foeniculacea* Pallas, XXV; 3 mm.: XXVII(?), XXXIII, XXXIV; 3—3.5 mm.: XXXVIII.

A clearly defined limit is nowhere to be observed; where an individual variability of at least 0.5 mm. is very frequent, it is not to be expected that 0.5 mm. can be used as a specific difference between two specimens.

As to the two following characteristics: the occurrence of isolated very large polyps,

and firmness of the colony, both these columns do not yield much; isolated large polyps occur on colonies of three stations; on IV some very large ones appear between the already very unequal polyps. — The firmness of the colony can show all possible transitions between rather firm, upright colonies and very slender, capilliform ones; it stands to reason that especially in this regard the vague and relative data of former authors fail me.

A rather important character is the angle between the branches and the branch which bears them, while the relative position of the branches is a specific character of great importance in the former descriptions. The following angles occur:

30°: XI, XV α (one of 90°!) XX, XXI β.

30°—45°: II, XII (partly), XVIII, XXV, XXVIII (rarely 90°), XXIX (rarely 90°), XXX (rarely 90°), XXXVIII, *Antipathes foeniculacea* Pall.

30°—90°: XXIV.

45°: I, V (one of 90°), XII (partly), XIII, XXI β, XXXII (one of 90°), XXXVII.

45°—60°: III, XVII.

45°—90°: IX, XXII, XXXV.

60°: XIV (or 45°), XXI α, XXXIV.

60°—90°: VIII, XIX, XXXIII.

nearly 90°: X α, XXIII, XXXVII (sometimes).

variable, but never 90°: VII, X β.

90°: IV (or 75°—90°), VI, XVI, XXVII (sometimes acute).

It is obvious how extremely variable this character is; rarely one and the same specimen shows everywhere the same angle, and the differences between two species are usually less than the individual variability. It is also remarkable in how great a degree two specimens of the same locality can differ in this respect.

The diameter of the axis diminishes in most cases regularly from the base towards the top, but some specimens show first an increasing diameter, which only after a few cm. diminishes. This is the case in: I, II, III, XIV α, XXI β. In a number of cases the behaviour of the diameter was not to be deduced out of the descriptions; in 14 cases I found an immediately diminishing diameter.

The distance between the branches varies in nearly every specimen from a few mm. up to some cm. In a few cases the distance is always only a few mm., viz. IV (a few mm.), X β (3 mm.), XXIV (a few mm.), XXVI (4—10 mm.) while in one case (XXVII) this value increases to 4—9 cm. Between this extremes there is a regular series of transitions to be found, so that a sharply defined limit cannot be given.

The shape of the branches is in far and away the most cases curved or sinuous; in II and XXI they are parts of a circle, but this is not a great deviation of the principal type. Sometimes the branches, which leave the bearing-branch at a wide angle, are so much curved as to become parallel or sub-parallel with the branch of lower order. The entire colony has in this case all its branches sub-parallel with the stem (XIV, XV). It is also possible that the branch is curved in a direction opposite to the curve of the branch of lower order (I). A unilateral insertion of the branches occurs in: IV, XXVI, XXVIII (according to Brook), XXXI,

XXXV (partly). The branches are always directed towards all sides of the colony, but sometimes a principal plane can be discerned, but never for all the branches; it is also possible that one colony shows a principal plane (VI α, VII α), while other colonies with the same characteristics are branched in all directions (VI β, VII β); one colony (XIX) has its secondary branches always in a plane, but not the primary branches.

To this review can be added the following characteristics, which are occasionally mentioned. — The colour is insufficiently known, through the preservation in spirits. — This may also be the cause of the deviations in polypar shape, as they appear in XIII α and β. — In some cases the elongation of the polyp and the oral cone in a transversal direction is used as a generic distinctive (e. g. in XXXI and XXXVII), but this elongation is signalled more than once, especially on younger and thinner branchlets, while it is entirely absent on the older parts. Far from accepting it as a generic difference I hold it to be unavailable even as a specific difference and in my opinion it is only a special adaptation to the available room on the axis, and in this manner entirely dependent on the very variable diameter of the axis. In various other Antipatharia I observed the same phenomenon.

Sometimes fusions of neighbouring branches occur, but since these fusions are far from frequent and even may be limited to one single fusion on a colony, in my opinion these fusions may be used only as a secondary specific characteristic, and even then only if they appear frequently and typically.

In view of the conclusions, deduced from the tabel, the species, reviewed in it, may be for the present joined with the Siboga-specimens in one single species *Euantipathes dichotoma* (Pall.) emend. n. n., the emendated diagnosis of which is as follows:

Colony: slender, sometimes with increasing diameter, branched in all directions or principally in the same plane, at angles of 30°—90°; mutual distance between the branches: a few mm. — 3 cm.; length of the branches: 1 — many cm.; branches curved or sinuous; sometimes fusions in the older parts.

Spines: triangular, vertical or sub-vertical on the axis, smooth, distal side usually steeper than the proximal side. Length 60 μ (30 μ — 200 μ); mutual distance 350 μ (210 μ — 1000 μ); 4—5 quincunxially alternating longitudinal rows; more rows on the older parts.

Polyps: in one series, usually on different sides of the colony; often predominating proximal lateral tentacles; oral cone usually large and swollen; mouth small and round or somewhat sagittally or transversally elongated; interpolypar distance in most cases 1.5—2 mm.

Former habitat.

(*Antipathes dichotoma* Pall.) Brook, Naples, 110 fm. (1 fragment); Marsigli, Marseille, 140 fm. (1 colony); Roule, Bay of Gascony, 400—1410 M.

(*Antipathes arborea* Dana) Dana, Sandalwood Bay, Fiji, 10 fm. (1 colony).

(*Antipathes foeniculacea* Pall.) Pallas, Mediterranean; Rumphius, Lamarck, Indic; Studer, Dirk Hartog, W. Australia, 45—50 fm., Mermaid Channel, 50 fm. (some? colonies).

(*Antipathes virgata* Esper) Brook, Persian Gulf; Esper, Indic; Lamarck, Mediterranean; L Rcule, Azores, Madeira, Cape Verde, 628—1384 M. (some? colonies); Cooper, Cargados Carajos, 30 fm.

(*Antipathes? lentipinna* Br.) Brook, Jeddah, Red Sea; Indic (1 colony).

(*Antipathes? mediterranea* Br.) von Koch (Brook) Mediterranean, Naples, 32—54 fm. (1 colony).

(*Antipathes furcata* Gray) Mason (Brook), Madeira (1 fragment); (var. α) Schultze, Seinebank, 2480 M. (1 colony); (var. β) Schultze, Seinebank, 2480 M. (1 fragment).

(*Antipathes viminalis* L. R.) Roule, Marocco, 2165 M. (2 colonies).

(*Antipathes gracilis* v. K.) von Koch, Naples (1 fragment).

(*Antipathes aenea* v. K.) von Koch, Naples (several colonies); Roule, Bay of Gascony, 400—1410 M.

(*Antipathes grandiflora* Silberfeld) Silberfeld, Uraga-canal, Japan, 75 M. (some fragments).

(*Antipathes pseudodichotoma* Silberfeld) Silberfeld, Sagami-bay, Japan (1 fragment).

(*Antipathes* n. sp.?) Silberfeld, Sagami-bay, Japan (1 fragment).

(*Antipathes gallensis* T. & S.) Thomson & Simpson, Galle, deep water (1 fragment).

(*Antipathella elegans* T. & S.) Thomson & Simpson, Gulf of Manaar, Ceylon (1 colony).

(*Antipathella gracilis* Gray) Gray, Madeira, 208 M. (some colonies); Cooper, Amirante Bank, 34 fm.

(*Antipathella Brooki* Johnson) Scrivener, West Indies (1 colony).

(*Paratylopathes atlantica* L. R.) Roule, Teneriffe, 540 M. (1 colony).

(*Paratylopathes Grayi* L. R.) Roule, Strait of Pico-Fayal. 98 M. (some fragments).

(*Antipathella ceylonensis* T. & S.) Thomson & Simpson, Foul Point, 46 fm. (1 colony + 1 fragment).

(*Antipathella? tristis* Duch.) Duchassaing, Guadeloupe, 200 fm.; Pourtalès, Santa Cruz, Montserrat, Martinique, St. Lucia and Barbadoes, 45—226 fm. (several specimens).

In connection with this diagnosis I will briefly trace the species enumerated in the tabel.

Antipathes dichotoma Pallas (non Gray). As Schultze (**11**) rightly remarks, it is very dubious if Pallas' *Antipathes dichotoma* (= Marsigli's *Litophyte* N° 9) is quite identical with the mediterranean specimen which Brook describes. Therefore I will trace the descriptions of Brook and Marsigli separately, although both appertain to *Euantipathes dichotoma*. As Brook had only one single specimen (a fragment!), for the present I will not lay too much weight on the very large dimensions of the polyps, since these dimensions in other species are very variable. — The numerical data in the tabel are deduced from Brook's figures. — Brook himself remarks that this species approaches *Antipathes foeniculacea* Pall. very closely, however without showing fusions, while in mode of branching this species keeps the due medium between *Antipathes foeniculacea* Pall. and Marsigli's *Litophyte* N° 9. — It is remarkable that von Koch does not describe this form among his specimens from the gulf of Naples; it may be presumed that von Koch's *Antipathes aenea*, which also shows very large polyps, is related to Brook's specimen of *Antipathes dichotoma*, also from the Mediterranean (Naples). As to *Antipathes aenea* v. Koch and the possibility of its being a separate species, I refer to the discussion of *Anti-*

pathes aenea v. Koch further on, where it will appear that von Koch only very reluctantly made it into a new species.

Litophyte N⁰ 9 (Marsigli). The data in the tabel I have immediately deduced from Marsigli's figures although it is necessary to point out that Marsigli's Plate XL fig. 179 is described by him as appertaining to the "Madrepore rameux". But there can be hardly any doubt that this is an error, for fig. 179 is very much like fig. 103, with very slight differences. — It is difficult to bring the figured polyps in some degree in accordance with Antipatharian polyps, especially for the biserial distribution, which Marsigli's figures in his figs 104 and 179 in the same manner. Only the clearly indicated spines make the Antipatharian character not longer doubtful.

Antipathes arborea Dana. Dana himself says that this species has the habitus of *Antipathes dichotoma* Pall. but only is "more spreading in its branches", which makes Brook remark that this is a character "which can scarcely be considered of specific value". The only remaining specific difference is found in the dimensions of the spines, especially in their mutual distance, but I have demonstrated that the limits of this value are not sharply defined compared, with other species. Besides it must be kept in mind that the spines figured by Pourtalès (and from this figure the data in the tabel are deduced) are inserted on a rather old branch which had already a diameter of 400 μ and which probably began to show irregularities in spine-dimensions, as usually is the case on older parts. — Moreover I have taken the most unfavourable measurements, for Schultze (**11**; p. 91) remarks about the mutual distance of the spines that up to six times this is the length of the spines, and this length is 120—150 μ. — The specimen of *Antipathes arborea* D. figured by Milne Edwards shows a great likeness in habitus to the Siboga-specimens of station 250 (Kur).

Rumphius' *Foenum marinum*, figured in his Herbarium Amboinense, on Plate LXXX in fig. 3, is greyish, brittle, and shrublike with a few curved, irregularly distributed branches, and is very much like *Antipathes virgata* Esp. Brook himself remarks that *Foenum marinum* "has a close resemblance" (**1**; p. 100) to *Antipathes arborea* and so, via this species, to *Antipathes virgata* Esp.

Antipathes foeniculacea Pallas. The descriptions, given by various authors, are too vague to make out with certainty which species they have in view. But the figure in Boddaert's translation of Pallas' Elenchus gives the impression that it is a species, which as far as the form of the colony is concerned viz. angles of the branches, length and mutual distance of the branches, etc. is not very different from the type of *Euantipathes dichotoma*. But the spines or the polyps are nowhere described, so that only for the present this species is joined to *Euantipathes dichotoma*. Later on, it may be lifted out of this combination, if, what I greatly doubt, more facts become known in this case. Brook also says "that this species may be allied to *Antipathes dichotoma* Pall., if not identical with it" (spaced out by me). — Schultze's words: "wenn überhaupt als selbständige Art gerechtfertigt" etc. (**11**; p. 91) indicate also that in his opinion it was not sufficienty grounded that *Antipathes foeniculacea* was made a species, although Schultze's opinion is principally based on the deficiency of the descriptions.

Antipathes virgata Esper (description by Brook). The greatest deviation from *Euantipathes dichotoma* in this species are the fusions, which occasionally occur in the colony, which Brook found in the British Museum. But when I add to this 1⁰ that Brook says: "but, in most cases,

the branches and branchlets are free", 2^0 that the specimen in Copenhague shows no fusions, 3^0 that, on ESPER's very clear figure of his *Antipathes virgata* there is no fusion whatever to be found, (F. COOPER makes mention of rare fusions between subbranches mutually and with the main stem) it is obvious, since BROOK united all these specimens, that he himself did not lay great weight on the rare fusions and that in his opinion they did not constitute a specific character. From the polyps it is only known that they are large (LACAZE DUTHIERS), but our knowledge is not much greater than this vague term for F. COOPER, who described several colonies makes mention of the polyps, however without giving a full description; he says only: the polyps are normal in type, 2.5 mm. in diam., about four to a centimetre; the colour is white or brilliant sulphur-yellow. — The granulated surface of the spines is of no great importance since in parts of the colony the surface of the spines is entirely smooth, while the examining of the numerous *Stichopathes*-specimens furnished proof of the great variability of this characteristic. — In his description of some specimens of *Antipathes virgata* Esp. L. ROULE remarks (14; p. 77) that at first view *Antipathes aenea* v. Koch and *Antipathes virgata* Esp. are very much like each other, and that only at further examination there are differences visible. In *A. virg.* the branches are longer and more slender, more upright, e. g. branches of 3—4 cm. long are only 1 mm. in diameter, and they are inserted at a rather acute angle; the spines are larger and more heavily built, and show some slight differences in structure. — All these differences are made of no importance by a careful study of the tabel.

Antipathes? lentipinna Brook. This species is made by BROOK, who avails himself of one single specimen in the British Museum. This specimen differed from *Antipathes virgata* Esp. in its having a marked difference in diameter between the branches and the branchlets, and in *Antipathes lentipinna* having longer and more slender spines, with a more elongated base. Besides the branches are "more spreading". As to this last point, it seems to me that a characteristic, which in *Antipathes arborea* is after BROOK (and in my opinion rightly) of "no specific value", in this case can not at once have acquired this value. — The other differences are not of such an importance that they justify the formation of a species; spines with an elongated base repeatedly occur together with other ones, just as spines which are longer or more acute. — The diameters of the axes of the Siboga-specimens, either increasing or diminishing, directly demonstrate the unstableness of this character. — The Siboga-specimen XI is like *Antipathes virgata* Esp. in the gradual decrease of the diameter of the branches, and it is like *Antipathes? lentipinna* Br. in the light colour of the branches, the smooth spines and the absence of fusions between the branches. Besides *Antipathes virgata* has on many parts of the axis smooth spines, and the blunt spines of this species occur on XI, but between the more aculeate spines of the *Antipathes? lentipinna*-type, especially on the younger parts of the colony.

Antipathes? mediterranea Brook. This species is a very good instance of the great variability of the angle between the branches in one and the same specimen. Besides this specimen is an instance of a colony, wherein only one single fusion occurs; as far as it is possible to conclude from BROOK's description, this fusion occurs in an old part of the colony; for the rest all the branches are free. — The polyps are badly preserved; BROOK can only give a few relative statements. After BROOK the spines of this species are in shape very much

like those of *Antipathes arborea* Dana. This and the mode of branching are the only facts, which could be described with certainty. Neither characteristic is sufficient to form a new species, next to *Euantipathes dichotoma.*

Antipathes furcata Gray (diagnosis by SCHULTZE and description by BROOK). BROOK says that the specimen in the British Museum was "some large species, allied to *Antipathes virgata* Esper". The number of longitudinal rows of spines is 6 after BROOK, and 5—6 after SCHULTZE, while I can deduce even a smaller number (4—5) from BROOK's figures of the spines, but I have used SCHULTZE's statement. The deviations from the type of *Euantipathes dichotoma* are very small and become even less if we keep in view both varieties, which SCHULTZE describes (**11**). — Both these varieties differ, if possible, even less from the type of *Euantipathes dichotoma.* Their number of longitudinal rows is 4 or 4(—5). However these varieties differ in some points, especially in structure of the polyps, but the characteristic predomination of the proximal pair of lateral tentacles is not entirely absent in *varietas* β; some polyps show it while it is regular in *varietas* α. Besides in SCHULTZE's opinion the habitus of the polyps is only of slight value, as it is easily influenced by the preservative fluids; also the difference in distance of the spines, etc. is of no great importance. — *Varietas* α is represented by a specimen with and one without polyps, and *var.* β by a fragment, all of them of the same locality. This is a reason the more to follow SCHULTZE's example and not to make species of this varieties, and even to interpolate them in the series of *Euantipathes dichotoma* (Pall.), whereto both of them obviously appertain, just as the original species *Antipathes furcata* Gray.

Antipathella elegans Thomson and Simpson. It is difficult to judge of this species, since the enlargement of the figures is not given. However the deviation in dimensions is not very large, if estimated in report to the diameter of the axis. Moreover the description of the colony is rather vague at some points; however the characteristics, which may be derived from it, are not very different from those of *Euantipathes dichotoma.* The angle between the branches is not given but the colony is dichotomically branched (probably is meant: pseudodichotomically). — The authors mention a great elongation of the polyps in the direction of the colony-axis but there are no figures, which might verify this point; since "the polyps occupy a length, corresponding to four spines in a longitudinal row" we must judge from this remark and from the given figures of the spines that the polyps will not be elongated to so very remarkable a degree, at all events not more than is the case with various specimens on the younger branches. The round mouth and the large oral cone also occur in *Euantipathes dichotoma.*

Antipathes viminalis Roule. After ROULE himself *Ant. viminalis* approaches "sensiblement" *Antipathes aenea* v. Koch. They differ only in number and length of the branches, and in the dimensions and mutual distance of the polyps. ROULE remarks (**14**): "G. VON KOCH a décrit sous le nom d'*Antipathes gracilis* une espèce qui me paraît correspondre à une variété d'*Ant. aenea*, différente du type, comme le nom l'indique, par la gracilité des rameaux et par la petitesse plus grande (sic!) des polypes. Sans doute cette variété équivaut-elle à *Ant. mediterranea* Brook .... De plus, cette espèce diffère d'*Antip. viminalis* par la plupart des caractères invoqués pour séparer cette dernière d'*Antip. aenea*, notamment par sa ramification plus touffue et plus courte, par ses épines moins nombreuses, et par ses polypes plus serrés.

Cependant, la petitesse relative des zooïdes d'*Antip. gracilis* v. Koch, jointe à la finesse des branches, contribuent à faire de cette variété d'*Antip. aenea* une transition du type vers *Antipathes viminalis*". — So there is, according to Roule, a connective line : *Antipathes aenea* v. K. — *Antipathes gracilis* v. K. — *Antipathes viminalis* Roule. These so-called species only differ in minor points, and, as is demonstrated by the table, not more than is reached by the individual variability. — In connection with the so-called *Antipathella*-character of *Antipathella elegans* T. and S., it is worth the trouble to quote the following sentence from Roule : "Il est à remarquer, en surplus, que la petite taille des polypes d'*Antip. viminalis* et la disposition assez fréquente des tentacules en deux groupes de trois, montrent à leur tour une sorte de passage des vrais *Antipathes* aux représentants du genre *Antipathella*".

Antipathes gracilis v. Koch. Referring to Roule's remarks about this species (quoted in my discussion of *Ant. viminalis* R.) it is only necessary, as far as this species is concerned, to refer to the tabel to show how slight are the deviations from *Euantipathes dichotoma*. — Von Koch disposed only of one single fragment of a colony, so that he himself remarked: "Er (viz. *Ant. gracilis* n. sp.) mag so lange bestehen bleiben, bis es Jemand gelingt, alle die vorhandenen Namen und Beschreibungen auf die wirklich existirenden Formen zu übertragen, resp. mit ihnen in Zusammenhang zu bringen." We must remark that v. Koch found rudiments of mesenterial filaments on four of the secondary mesenteries.

Antipathes aenea v. Koch. Also for this species I can refer to Roule's remarks, not only at *Antipathes virgata* Esper (**14**; p. 77) where the difference between this species and *Ant. aenea* does not appear to be so very large, but also at *Antipathes viminalis* where he indicates a transition from *Ant. aenea* v. K. via *Ant. gracilis* v. K. towards *Ant. viminalis* R. The following quotation from von Koch (**2**) proves my opinion: "Ich habe lange gezaudert ob ich *Antipathes scoparia* oder *Antipathes dichotoma* als Überschrift setzen soll, denn in den Beschreibungen dieser beiden Arten von verschiedenen Autoren findet sich Vieles was auf die mir vorliegende Form passt. Aber einerseits schien es mir nicht unbedenklich diese beiden Arten, von denen mir typische Exemplare nicht vorliegen, einfach zu vereinigen, andererseits fand ich in deren Beschreibungen auch Einzelheiten, welche sich nicht genau auf meine Exemplare anwenden liessen. Schliesslich griff ich zu dem unschuldigsten, wenn auch etwas odiosen Mittel eine neue Art zu creiren welche ich nach dem eigenthümlichen Aussehen des Skelettes als *aenea* bezeichne. Hoffentlich gelingt es mir, für eine spätere eingehendere Monographie, das nöthige Material zu erhalten um den neuen Namen wieder hinauswerfen und einen älteren an seine Stelle setzen zu können" (**2**; p. 202, 203). — One of the greatest differences is constituted by the dimensions of the polyps, but in this respect I may refer to the review of the tabel. The other differences are but very slight. The elongation of the base of the spines is more than once visible in the immediate neighbourhood of the normal spines on specimens of *Euantipathes dichotoma*. — Occasionally fusions occur, and in this respect I can refer to my discussion of *Antipathes virgata* Esp.

Antipathella gracilis Gray (descriptions by L. Roule and Johnson). This is not the species, given by Brook and based on material in the British Museum, for the latter species is identical with *Antipathella Brooki* Johnson (see there). The only great deviation, which Roule's

and JOHNSON's species shows from the type of *Euantipathes dichotoma* is the large distance between the spines; this deviation is less conspicuous if we consider the review of this part of the tabel, and this characteristic in itself is not sufficient to form a species. The elongation of the polyps, indicated in ROULE's figures and the base of the *Antipathella*-character, is not very conspicuous and is seemingly accentuated by the very strong distal inclination of the tentacles and by the small diameter of the branch. The colony figured by ROULE is suited to the type of *Euantipathes dichotoma.* — JOHNSON mentions i. a. the transversally elongated mouth, while the polyps in ROULE's figures have a round or sagittally elongated mouth! JOHNSON gives 30°—40° as the angle between the branches, while this value in ROULE's colony can vary from 45° to almost 90°!

Paratylopathes atlantica L. Roule. The mode of branching of this species is widely divergent from that of BROOK's *Tylopathes*-type, and ROULE calls attention to the likeness between the colony of *Paratyl. atl.* and the colonies of *Antipathella*-species. — The figures of the polyps and the spines agree very well with the type of *Euantipathes dichotoma*, except in the greater interpolypar distance. In the text ROULE gives as this distance 3—3.5 mm., but deduced from ROULE's figure a distance is found of 2—2.5 mm., a value which differs much less from the middle value in *Euantipathes dichotoma.*

Paratylopathes Grayi L. Roule. This author says: "Les deux espèces (viz. *Paratylop. Grayi* and *atlantica*) sont fort voisines en somme". — The colony figured by ROULE is very much like the figure of *Antipathes glaberrima* v. Koch. — In most points there is no great difference between *Parat. Grayi* and *atlantica*; the angle between the branches is larger in *Parat. Grayi* than in *Parat. atlantica.* — Not too much weight should be laid on ROULE's "dimorphisme" of the polyps of *Parat. Grayi.* He describes polyps, which are very small and which are interpolated between the larger ones, but it is not clear for what reason ROULE will not look upon this smaller polyps as young individuals and prefers to speak of dimorphism; I do not think this right. In either case: if it is a dimorphism, this dimorphism is present in most cases (if not all) of the described species, as is demonstrated by the preceding descriptions. Often I have described such young polyps or found them described by other authors, sometimes on an entire colony, sometimes only on a part of a colony, while the other part had uniform polyps.

Antipathella Brooki Johnson (described by BROOK as *Antipathella gracilis* Gray). This is a specimen described by BROOK as GRAY's species, but which later on appeared to be not entirely identical with other specimens, found in Madeira, and described by JOHNSON as the true *Antipathes gracilis* Gray. BROOK's specimen got a new name from JOHNSON. — However the difference is not very great; ROULE remarks on this point: "Dans la réalité ces deux espèces paraissent assez affines; les principales dissemblances portent sur les épines, moins nombreuses chez *A. Brooki* Johnson que chez *A. gracilis* Gray". As in other respects the colonies are very much like each other, in my opinion these more crowded spines of *Antipathes gracilis* Gray are a transition from *A. gracilis* towards the middle type via *Antipathes Brooki* Johnson, for the distance of the spines is as follows (quite the opposite of what ROULE remarks): in *Antipathes gracilis* Gray ± 1000 μ, deduced from the figures, and in *Antipathes Brooki* Johnson much less viz. 230 μ, deduced from BROOK's figure. This specimen shows frequent fusions of the larger branches, but as in some cases fusions are also recorded in varying degree (a single

one in XXVII, and some in XXV and XXXI) I cannot find any reason to keep this species apart.

Antipathes grandiflora Silberfeld. The description is not very complete; the number of longitudinal rows is wanting, as well as the dimensions of the tentacles and such like. There is given a very good figure of the entire colony, which is very much like *Antipathes arborea*. According to SILBERFELD the mode of branching is the same as in *Paratylopathes atlantica* Roule, which I have already discussed. The characteristics, described by SILBERFELD, are not different from various specimens of *Euantipathes dichotoma*. — Worth while is the occurrence of very large polyps between the normal ones, as is described in some Siboga-specimens.

Antipathes pseudodichotoma Silberfeld. According to SILBERFELD's Plate II, fig. 4 *a* this colony is very much like various Siboga-specimens. In my opinion BROOK gave enough species like this fragment, for instance *Antipathes furcata* Gray. — The characteristics, which may be found in the description, fit in the tabel.

Probably the very incompletely described fragment of SILBERFELD's *Antipathes n. sp.*? which has spines 93 μ in length, with a mutual distance of 300—500 μ, placed in 4—5 longitudinal rows, inserted at right angles with the axis with a slightly concave, slanting proximal side, also appertains to this series of species. The polyps are low, oval and sometimes transversally elongated to a rather high degree. The angle between the branches and the branch of lower order is acute. — Beside the discussed species there are various of the formerly described species, which may be considered as appertaining to *Euantipathes dichotoma*. Usually the description is too incomplete to permit a decisive opinion. Such species are e. g.:

Antipathes gallensis Thomson and Simpson. The mode of branching is incompletely given. The regularly tapering branches are distributed irregularly so that the colony has a "shrub-like appearance, suggestive of the broom". The shape of the spines, etc. is very well in accordance with *Euantipathes dichotoma*; there are 5 longitudinal rows. As to the polyps it is worth noting that the authors remark: "the polyps are elongated in the direction of the axis — this being specially marked on the smaller branchlets"; these words show how easily the so-called *Antipathella*-type is formed. — The form of the polyps agrees with those of *Euantip. dich.* The words: "this species differs from any known form both in its mode of branching and in the arrangement of the spines" are not entirely right, since BROOK describes *Antipathes virgata* as "corallum large, resembling the Broom". (**1**; Synopsis of species pg. 98). — It is to be regretted that there are no figures, with the exception of a figure of the spines, which is but imperfectly serviceable.

Antipathella ceylonensis Thomson and Simpson. The shape of the colony, except for the rare fusions, which however occur also in other species or specimens of the *Euantipathes dichotoma*-series, is very much like that of *Euantip. dich.*; the angle between the branches varies from 60°—90°. The branches are very slender and several cm. in length (up to 6 cm.). — The shape of the spines fit in the diagnosis of *Euant. dich.*; the number of rows is 4; the polyps are described in a desultory manner; they are elongated in the direction of the colony-axis (cf. the remark in the discussion of the preceding species); the mouth is round and is situated on the top of a prominent cylindrical oral cone. The authors themselves call attention to the near approach of this species to *Antipathella*? *tristis* Duch. The colonies of this species, figured by F. COOPER confirm this opinion, but his description is not detailed enough.

Antipathella? tristis Duch. (description by BROOK). The description of this species shows many vague data, but the delicacy of this species, the very slender branches, the not frequent fusions (BROOK says: "they are more properly defined as adherences") are not in disaccord with the type of *Euant. dich.* The spines, figured by POURTALÈS, are also like those of *Euant. dich.* especially like the somewhat more heavily built spines of IV and X from the tabel. — The polyps are very vaguely described.

Some other species (viz. some of BROOK's *Aphanipathes*-species) might also be included.

Intentionally I have said that all these species should be united for the present for in many cases a decision could only be given by the examining of more entensive material. But the here-given assembling of many former species into one is only meant as a proof of a possible sifting of the numerous data. — Without much trouble many new species might be created, and the trouble would be as small to arrange the various specimens in varieties as is briefly pointed out in what follows. The var. α SCHULTZE, containing SCHULTZE's specimen and XVII, would be characterized by the polyps of SCHULTZE's Pl. XIV fig. 10 and my fig. 53*a*, mouth sagittally elongated, spines at a mutual distance of $\pm$ 300 μ, with their distal side at right angles with the axis, and a colony as SCHULTZE's Pl. XIV fig. 14. — SCHULTZE's var. β with a colony as SCH.'s Pl. XIV fig. 12, polyps as SCH.'s Pl. XIV fig. 11, spines at a mutual distance of 400 μ and their distal side also at right angles with the axis, would contain SCHULTZE's specimen and IV and XXIV. — Specimens VI and XXVII could appertain to a var. *verticalis* with a type of polyp very much like var. α, but with their branches at right angles with the stem or with the branch of lower order. *Antipathes furcata* Gray, with the diagnosis given by SCHULTZE (**11**; p. 91) makes a var. *Grayi* together with *Antipathella gracilis* Gray (description by JOHNSON), while *Antipathella Brooki* with its fusions makes a var. *symphysa*.

A var. *virgata* with a type of polyp very much like var. α, and an angle of 30° (—45°) between the branches, contains *Antip. virgata* Esp., *Antip. aenea* v. K., *Antip. dichotoma* Pall., *Antipathes gracilis* v. K., *Antipathes viminalis* R.

A var. *parallela* with type of polyp as var. α, long spines, an angle of 30° between the branches, which lie in a single plane and which are in their distal part subparallel with the stem, could be made by XX.

Comparing the characteristics of *Euantipathes glaberrima* Esper (emend.) with the data in the tabel of *Euantipathes dichotoma*, a very great concordance is found, in fact so great that at first I considered to combine both species. But at further thought it appeared to me more desirable to keep both species asunder, although not so far as other authors did in view of the sparingly distributed spines and the anatomical structure of the polyps. Although there are no specimens of this species among the Siboga-material, here I will give a critical review of this species, together with all other *Leiopathes*-species.

Antipathes glaberrima Esper.

Leiopathes glaberrima (Esp.) M. Edw. Synon. see BROOK, Chall. Rep. Antipatharia, p. 95; JOHNSON, Notes on the Antipatharian Corals etc. Madeira. Proc. Zool. Soc. London 1899.

Leiopathes lenta (Pourt.). Synon. see BROOK. Chall. Rep. Antipatharia, p. 96.

Antipathes glaberrima Esp. VON KOCH, Antipathiden des Golfes von Neapel, p. 194, figs. 2, 4, 6.

Leiopathes Grimaldii R. L. ROULE, Antipathaires et Cérianthaires, Camp. Sc. du Pr. de Monaco, fasc. XXX p. 73, pl. III, figs. 1. 1*a*; pl. VII, fig. 4

Leiopathes expansa Johns. J. Y. JOHNSON, Notes on the Antipatharian Corals etc. Madeira. Proc. Zool. Soc. London 1899.

Under the name of *Leiopathes glaberrima* Esp. BROOK has described a species, which is the same as *Antipathes glaberrima*, described by VON KOCH among the neapolitan Antipatharia. Both descriptions were published almost at the same time. — In my critical review of the genera I have spoken of the desirability of abolishing the genus *Leiopathes* and of uniting it with *Antipathes*, especially with *Euantipathes*.

Leiopathes glaberrima (Esp.) M. Edw. is figured by ESPER but not in a manner sufficient to deduce characteristics from it; only the stem with the stumps of the snapped-off primary branches is figured; all branches of higher order are entirely absent. BROOK describes the corallum as large, irregularly branched, with long crooked branches of more or less elliptical section. At other times the growth is more regular, giving a denditric form not unlike a flattened ash. Stem and branches are jet black and polished, gradually tapering. Ultimate branches slender, laxly pinnate, pale brown and covered with short, distant spines. A specimen from Dr. DOHRN is laxly and irregularly branched and the ultimate pinnules are usually at rigth angles with the branchlet from which they arise. One fragment, 5.5 cm. long, bears 8 branchlets, most of which bear one or two pinnules at right angles. The branchlets are 1—2 cm. apart and from 1—3 cm. long. Irregularly arranged and springing from any portion of the circumference zooids vary very much in size (evidently depending on their age). Interval: irregular, 1—2 mm. apart; projecting rarely 0.5 mm. beyond the surface of the coenenchyma; mouth usually sagittally elongated, oral cone dome-shaped. Tentacles subcylindrical, arranged in pairs. Lateral tentacles 1 mm. long, sagittal ones 1.5 mm. and inserted at a lower level. The sagittal tentacles project horizontally, the lateral ones are inclined towards the mouth or vertical (in the younger polyps). Sometimes young and adult polyps alternate regularly. The habitus of the colony is very much like that of various specimens of *Euantipathes dichotoma*, while the form of their polyps has many points in common: often sagittally elongated mouth on a dome-shaped oral cone, dimensions, etc. The spines, so far as they occur, are completely similar in shape to most of the spines of *Euantipathes dichotoma*; smoothness of the older parts of the colony I have also found on some specimens of the latter species. The right angle between branch and stem or branch of lower order repeatedly occurs in *Euant. dich.*, in some specimens even without a single exception (VI, station 79^a).

The description of *Antipathes glaberrima* given by VON KOCH differs only in minor points from the description by BROOK, e. g. in interpolypar distance (1.75 mm.), mutual distance of the spines (500—800 μ, while this is 600 μ by BROOK). Both give four longitudinal rows, and spines 40 μ long, which is also suited to *Euant. dich.* VON KOCH says that the branches are bent in parts of a circle, and this is also to be remarked in some Siboga-specimens of *Euant. dich.*

If we compare this data with the *Leiopathes*-species more recently described by ROULE and JOHNSON and with *Leiopathes lenta* Pourt. described by BROOK, there are no very great differences to be found between these species and *Leiopathes glaberrima*. — *Leiop. lenta* is only known in some fragments, viz. some branches 10—12 cm. long and everywhere subequal in diameter. The mode of branching is unknown. The branches are long and slender like horsehair and irregularly pinnate. The type of the polyps is the same as in *Leiop. glaberr.*, as BROOK himself remarks, but the polyps are much smaller and more distant; the tentacles show a greater tendency to be arranged in two parallel rows, but besides that the tentacles of *Leiop. glaberr.* are arranged in three pairs, it should be kept in mind that the thin branches of *Leiop. lenta* quite naturally compel the tentacles to arrange themselves in parallel rows, while on the larger (in these specimen not present!) branches a more radiate arrangement is very plausible. — The type of spines is the same as in *Leiop. glaberr.*, with 3—4 longitudinal rows. The dimensions are not given, but from POURTALÈS' figure I would deduce a length of the spines of 75 μ and a mutual distance of 400 μ. The polyps have a large round oral disc, and small and large polyps alternate regularly on the axis. All this differs very slightly from *Leiop. glaberr.* and BROOK himself speaks of a general resemblance (e. g. in the polyps) or a relationship to *Leiop. glaberr.* indicated by the irregularity of branching and the delicacy of the pinnules. BROOK derived the polypar data from POURTALÈS, whose description of the polyps is open to various interpretations of their shape.

Leiopathes Grimaldii Roule "se rapproche beaucoup de *Leiop. glaberr.* Esp.". The principal differences are the following: *Leiop. glaberr.* is laxly branched, in all directions, branches far apart, long and rather flexible; polyps crowded, rather large. *Leiop. Grim.* is densely branched, in a plane, fan-like, branches close together, short and rather stiff; polyps not so crowded and twice as small as in *Leiop. glaberr.*

The lax or dense mode of branching is of no very great importance, since it is dependent on the mutual distance between the branches and since this value is rather variable. The branches of *Leiop. Grim.* follow "à intervalles peu inégaux, de 1 à 1.5 cm. en moyenne"; in *Leiop. glaberr.* this distance is not so

very different, for BROOK gives: "1—2 cm. apart", while the branch, which BROOK described, was 5.5 cm. long and bore eight branches, so with an average distance of less than 1 cm. So in this regard there is no great choice between both species. The branches of *Leiop. Grim.* lying in a plane and forming a fan-shaped colony, while the branches of *Leiop. glaberr.* are directed towards all sides, constitute a specific character, the value of which is very much lessened, when we see how in *Euantipathes dichotoma* specimens of the same locality (station 144) are in every respect completely similar, except that one specimen is branched in a plane and the other not!

The length of the branches is approximately 1 cm. in *Leiop. Grim.* and 1—3 cm. in *Leiop. glaberr.*, which values are neither very unequal. — The interpolypar distance of *Leiop. Grim.* is very variable and is according to ROULE's description 1.6 mm. at the utmost and according to his figure 1.8 mm.; BROOK calls attention to the also very variable interpolypar areas of his colonies: 1—2 mm. distance between two polyps, which value, according to BROOK's figure, is equivalent with 1.5 to 2.5 mm. as intertentacular distance. Not only this data deviate very slightly from those of *Leiop. Grim.*, but also it is not very clear how ROULE deduces from this that the polyps of *Leiop. Grim.* are less crowded; in my opinion the opposite is sooner right. — The fact that *Leiop. Grim.* has smaller polyps is no great objection, as in this regard we can make use of *Leiop. lenta* as a transition. Besides the dimensions of the polyps depend for so great a part from the preservation that SCHULTZE very rightly will use the diverging types of polyps of var. α and β of *Antipathes furcata* Gray only as a difference between varieties but will not give them a specific value. — In this manner only very slight differences remain between *Leiop. Grim.* and *Leiop. glaberr.*, so that I cannot hesitate to join both species into one.

Finally *Leiop. expansa* Johnson; this colony is densely branched in a single plane or in parallel planes, therefore ditto as *Leiop. Grim.*, while the stem and the branches are elliptical in section, therefore ditto as *Leiop. glaberr.* The branches are curved in irregular zigzags, as in *Leiop. glaberr.* and *Leiop. Grim.*, and alternate to the right and to the left, as the larger branches of *Leiop. Grim.* The angle between branch and stem etc. is almost 90°, as in the other species; the ultimate branchlets are hairlike (cf. "slender as horsehair" in *Leiop. lenta*). The spines are shaped as in other species, small, upright, conical to subtriangular. The polyps are light-red, while the polyps of VON KOCH's *Antipathes glaberr.* are orange or flesh-coloured to brownish red, in *Leiop. Grim.* rather clear yellow-red and in JOHNSON's specimen of *Leiop. glaberr.* warm-brown. — The branches do not show fusions, like *Leiop. glaberr.* (one specimen of *Leiop. Grim.* has two fused branches). ROULE remarks (**11**; p. 75) that JOHNSON's description of *Leiop. exp.* is too vague to identify it with *Leiop. Grim.* although he expects that through a better description of the polyps various characteristics of the colony of *Leiop. exp.* might have permitted ROULE to identify *Leiop. Grim.* with JOHNSON's species. He is further of opinion that JOHNSON's description makes it difficult to decide whether *Leiop. exp.* is a new species or appertains to the cycle of forms of *Leiop. glaberr.* and *Leiop. Grim.* — The colony, which JOHNSON figures, is very much like the beautiful figure which ROULE gives of his colonies. — It seems to me that there is no objection to the joining of all reviewed species into one, which must be called *Euantipathes glaberrima* Esper (emend.), with the following diagnosis:

COLONY: Curved in zigzags, irregularly and densely branched; axis often elliptical in section; black, polished on the older parts; branches at right angles, in a plane or in all directions; distance between the branches 2 cm. at the utmost; length of the branches 3 cm. at the utmost.

SPINES: Only on the younger parts of the colony; triangular, at right angles with the axis, in four longitudinal rows; 40—75 μ long; mutual distance 400—800 μ.

POLYPS: Domeshaped oral cone with round or sagittally elongated, slit-like mouth; sagittal tentacles 0.8—1.5 mm., lateral ones sub-equal 0.5—1 mm; sagittal tentacles inserted at a lower level and horizontally projecting; lateral ones vertical or inclined towards the oral one. Colour: yellow-red to warm-brown.

On comparing this diagnosis with that of *Euantipathes dichotoma* and the data in the tabel of this species, it appears that there is a great likeness between both species, so that they are to be considered as nearly related to each other. There is hardly any characteristic of *Euantip. glaberr.* which is not present in *Euantip. dichot.*, except the extreme scarcity of spines on any but the youngest parts. Even the typical curve of the branch in an opposite direction to that of the branch of higher order, which ROULE mentions for *Leiopathes Grimaldii*, is not absent in *Euantipathes dichotoma* (cf. tabel: I. station 7).

6. *Euantipathes ulex* (E. and S.).

[*Antipathes*] *ulex* E. & S. BROOK, Antipatharia. Chall. Rep., p. 167, pl. XI, fig. 5. For synon. cf. BROOK.

Stat. 305. Solor-strait. 113 M. Stony bottom. 1 spec.

This colony is 6 cm. in height; the stem is curved in part of a circle and bears a great number of branches in two rows, which are lying almost in the same plane, which is slightly curved. The distance between the branches is upwards of 2 mm. but this value is somewhat variable. The base of the colony bears only stumps of broken branches. The complete branches are ± 0.5 cm. long; some of them are longer (up to 2.5 cm.) and in the same manner bear secondary branches. — The branches do not alternate regularly to the right and to the left; sometimes they are on both sides on the same level; they are slightly curved and pointed. They are inserted at an angle of ± 60°, or slightly over, with the stem or the branch of lower order. The branches have a distal direction and like the stem they have a propensity for curving towards the back of the colony, while the polyps are inserted on the front of the colony. Usually there are no tertiary branches and fusions do not occur.

The spines (fig. 62 *a*), are large and smooth, with a somewhat concave distal side and a somewhat convex proximal side. The distal side is almost at right angles with the axis. Their length, sub-equal on all sides of the axis, is 110 μ.; their mutual distance is very variable with an average of 300 μ. There are 4 longitudinal rows, sometimes alternating quincunxially, but soon shifted through the very variable distance of the spines. On the older parts of the colony the spines are farther apart and they are smaller (fig. 62 *b*).

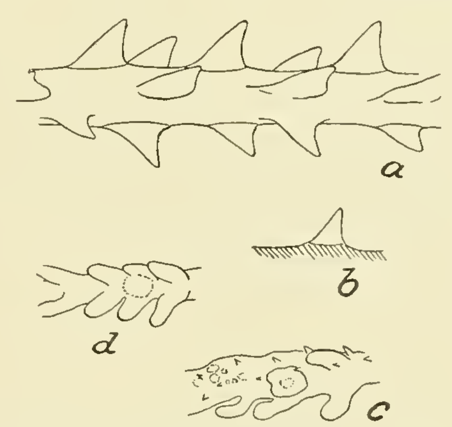

Fig. 62. *Euantipathes ulex* (E. and S.) *a* Spines on a branch; *b* spine on the stem of the colony; *c*, *d* polyps; *a*, *b* 52 ×; *c*, *d* 14 ×.

The polyps are badly preserved, and milkwhite. The tentacles are arranged in two parallel rows (fig. 62 *c*, *d*). The length of the tentacles is usually 0.375 mm. and is at its max. 0.45 mm. The distance between two pairs of tentacles is 0.35 mm., while the distance between the lateral pairs of neighbouring polyps is somewhat larger, viz. ± 0.5 mm., so that it is clearly visible which pairs form a polyp. Many polyps show ova, visible through the bodywall and even through the tentacles. The oral cone is not very high and the mouth is small. The polyps are inserted in a single series, on one side of the colony. The shape of the colony is very much like *Antipathes ulex*, figured by ELLIS and SOLANDER. The character of the spines is the same as in BROOK's descriptions. The polyps are absent in all former colonies; on account of the elongation of the polyps BROOK doubtlessly would have placed this species among *Antipathella* or even among *Parantipathes*, but the elongation of the polyps on the thinner branches is so common that, since the polyps on the thicker parts are absent, in my opinion this species ought to be considered as an *Euantipathes*.

As to the very great variability of [*Antipathes*] *ulex* I refer to the description by BROOK. — This *Euantipathes* is surely very nearly related to *Euantipathes dichotoma*, and it might be joined to this species.

Former habitat. Ellis Batavia; Lamarck E. India and Philippines; Lamouroux Indic; Gray Philippines; Studer Mermaid Channel.

7. *Euantipathes longibrachiata* n. n.

Stichopathes japonica Silberfeld. SILBERFELD, Japanische Antipatharien, p. 17, fig. 2.

Stat. 33. Bay of Pidjot (Lombok). 22 M. and less. Mud, coral and coral sand. ? spec.

Numerous small fragments (branches) and a rather large piece of a colony are found on this station. This last-named fragment is almost 0.5 m. in height. The stem (or the largest branch) is at first nearly straight with irregular curves, but ends in an irregular spiral, which makes 1—1.5 convolution. The first part, ± 2.5 dm. in length, is branched, but the rest is unbranched and is 40 cm. long. The snapped — off branches, from the same locality, have the same length, 0.5 m. and even more (!), without bearing secondary branches. — On the branched part of the colony the branches are inserted at irregular intervals and on all sides of the axis. Their mutual distance varies from a few cm. to 1 dm. and over; even on one place two branches are inserted immediately above each other, with their basal parts touching. — The angle between branch and stem is either 90° or 45°, but in most cases 90°. Afterwards the branch is curved towards the top of the colony. The branches are irregularly curved, but their top is wound spirally or sub-spirally. — The diameter of the black and shining axis is 2.5 mm. at the base of the colony-fragment and this value diminishes gradually towards the slender, elastic and thin tops of the branches. The entire fragment is firm enough to stand upright, without bending.

The spines (fig. 63) at the base of the fragment are at right angles with the axis, with concave sides and a very blunt apex (fig. 63*a*). The surface of the spines is very slightly granulated; their length, equal on all sides of the axis, is 115 μ and their mutual distance is 650 μ. There are 8—9 longitudinal rows, usually alternating in a quincunx, but sometimes shifted; the longitudinal rows are wound in a very steep spiral round the axis. On the top of the colony the spines (fig. 63*b*) are distally inclined with a concave distal side and a convex proximal side, but always with a blunt apex. The surface of these spines is almost smooth; their length is 125 μ and there are 7 longitudinal rows, but with the same distance of the spines as on the colony-base.

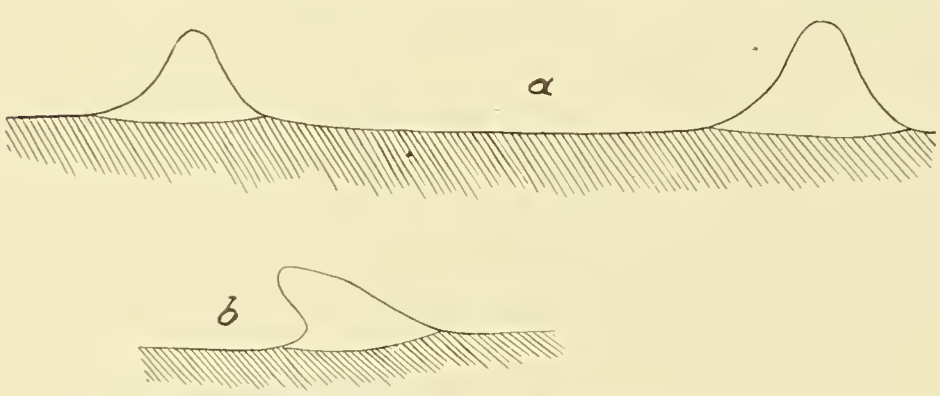

Fig. 63. *Euantipathes longibrachiata* n. n. *a* Spines on the base of the colony; *b* spine on the top of the colony; *a*. *b* 92.6 ×.

The polyps (figs. 64 and 65) are large and very prominent, while the intervening coenenchyma is very thin so that the axis is dimly visible through it together with the spines. The interpolypar distance is 2 mm., and there is only one single series. — The oral cone is high, large and domeshaped, with a small round mouth. The sagittal tentacles predominate

over the lateral ones; the former are 920 μ long, the latter 650 μ. Usually the tentacles are not lying against the colony-axis, but stand out free from the axis; sometimes they are pressed against the oral cone, covering it. On other parts of the colony they are directed distally, especially in fig. 64, where the proximal pair of lateral tentacles, which is everywhere predominant over the distal pair, lie around the oral cone, while the distal lateral tentacles are pressed together. The transversal limiting groove and the longitudinal groove on the back of the axis are clearly visible. Young polyps alternate irregularly with the adult polyps.

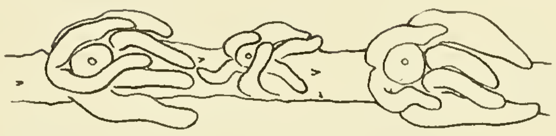

Fig. 64. *Euantipathes longibrachiata* n. n. Polyps; 15 ×.

On the base of the colony the polyps are larger (fig. 65) and more crowded; the base of the tentacles may be very much swollen, possibly through the presence of ova, which is not evident in the polyps through which sections were made, and which were derived from the top-part of the colony; perhaps the top and the base of the colony are not filled with ova at the same time. The rest of the tentacle is cylindrical, so that there is a rather swift transition from the swollen base towards the higher part (fig. 65). Remarkable in this species is that between the fragments is found an unbranched "colony", 90 cm. long, irregularly sinuous with parts of spiral convolutions, thin and very slender; the basal diameter of 350 μ increases to 1050 μ on a height of 10 cm.; over a long distance this diameter remains subequal, to diminish afterwards towards the very slender, snapped-off top (300 μ in diameter). The character of the spines is in every respect the same as in the fragment described above (fig. 63 *b*) so that there is no doubt about the fact that we have got here a snapped-off branch of a branched colony, or at the utmost a still unbranched young specimen of a branched species. But I intend to show that, being in the possession of this fragment only, I would not have hesitated, considering the great length, to look upon it as a *Stichopathes*, which, in view of the typical increase in diameter found in several other *Stichopathes*-species (e. g. *Stich. variabilis*) would have been included in one of the *Stichopathes*-species; so the difficulty of the Indivisae-Ramosae-division is apparent. — This makes it possible to identify the Siboga-specimens with *Stichopathes japonica* Silberfeld. This author describes some fragments from the Enoura-bay, 1 mm. in diameter, and "bei dem spiraliges Wachstum angedeutet ist". The length of the spines (142 μ), their mutual distance of more than 600 μ (deduced by me from the descriptions), the shape of the spines, which is, according to the description, very like fig. 63 *a*, the 6—7 alternating longitudinal rows, which are spirally wound round the axis, are all of them points of conformity. The form of the polyps is very like that of the Siboga-specimens (cf. Silberfeld's fig. 2 on **21** p. 17 with my fig. 65) but that the dimensions are somewhat larger. Besides the mesogloea of the Siboga-specimens is also a very thick layer with very fine transverse fibres, just as is described by Silberfeld for *Stich. japonica* (p. 17). Without any doubt Silberfeld was in the condition which I supposed when discussing the 90 cm. long fragment, viz. that he was in the possession of unbranched branches of a branched colony only, which gave the impression of

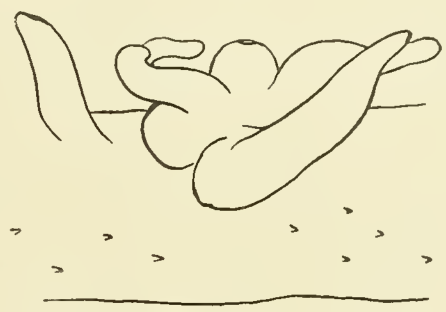

Fig. 65. *Euantipathes longibrachiata* n. n. Polyp; 15 ×.

being a *Stichopathes*-species. Thence I have identified my specimens with SILBERFELD's species, but now as an *Euantipathes*. The name, which ought to be *Euantipathes japonica* cannot be used, since BROOK has described an *Antipathes* (= *Euantipathes*) *japonica*, with which SILBERFELD's species is not identical. — In view of the great length of the branches I propose the name *longibrachiata*.

Although there are points of conformity between this species and *Euantipathes dichotoma*, I will keep this species intact, in view of the form of the polyps, and especially of the enormous length of the branches, their shape and the deviations in the spines.

Diagnosis:

COLONY: Black, branched in all directions; branches inserted at an angle of 45° or 90°, at a mutual distance of a few mm. to more than 1 dm. — Increase of diameter above the base. Branches very long and slender, up to nearly 1 m. long, unbranched, sinuous and partly wound in a spiral.

SPINES: Blunt, smooth or slightly granulated, at right angles with the axis, with concave sides, or (in the higher parts of the colony) distally inclined with concave and convex sides. Length 115—142 μ, mutual distance 650 μ; on the younger parts 6—7 rows, on the older parts 8—9, with a quincunx.

POLYPS: Large and conspicuous; in one series; domeshaped oral cone with small round mouth. Proximal lateral tentacles predominating. Sagittal tentacles at a lower level than the lateral ones. Interpolypar distance 2 mm. Length of the tentacles 650 μ to 2,5 m.m.

Former habitat: SILBERFELD Enoura-bay (Japan). 120 M.; 34° 58′ N. 139° 42′ E. 144 M.

8. *Euantipathes ericoides* (M. Edw.) em. (Pl. VIII, fig. 6).

Arachnopathes ericoides M. Edw. MILNE EDWARDS, Coralliaires, t. 1, p. 320; BROOK, Antipatharia. Chall. Rep., p. 163, pl. XI, fig. 22.
Antipathes ericoides Pall. PALLAS, El. Zooph., p. 218; ESPER, Pflanzentiere, pl. VI.
Arachnopathes aculeata Br. BROOK, Antipatharia. Chall. Rep., p. 165, pl. VI, fig. 11.

Stat. 240. Banda. From 5—20 M. Black sand, coral. 1 spec.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. Buka- or Cyrus-bay, Rotti-island. 34 M. Mud, coral and Lithothamnion. 1 spec.

The colony of station 299 is snapped off near the base; there is no special principal branch or stem, for there is a great number of equivalent branches, all of them densely branched in all directions, with numerous fusions between them, resulting in an entangled mass of branches. The mutual distance of the branches is very short, 0.5 cm. at the utmost. — The branches taper swiftly so that, especially in the basal half of the colony, many spineshaped branchlets appear. All branches are somewhat curved and usually the convex side of the branches bears most of the branches of higher order. The angle between the branches varies from 60° to 90°. — The height of the colony is 15 cm., its breadth 15 cm., and its greatest thickness 10 cm. One side of the colony is flat, the other side is rounded, so that a section of the colony is

a half-circle. — All branches are directed towards the top of the colony; the ultimate branches are 1—1.5 cm. long, and slender. The fusions occur even with the ultimate branches.

The spines (fig. 66 *b*) are somewhat distally inclined; their distal side is concave, and their proximal side convex; their surface is smooth. There are 4 longitudinal rows, alternating in a quincunx. The length of the spines is 120 μ, and somewhat less on the older parts of the axis; their mutual distance is 270 μ. The spines perforate the coenenchyma but not the polyps.

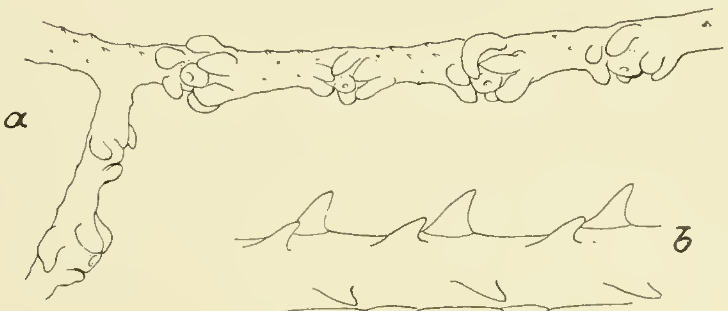

Fig. 66. *Euantipathes ericoides* (M. Edw.) em. *a* Polyps; *b* spines; *a* 14 ×; *b* 52 ×.

The polyps (figs. 66 *a* and 67) are placed in a single series, not on a special side of the colony. On the older parts of the colony the polyps are rare or entirely absent. The colour of the polyps is opaque, light greyish brown, and, just as the coenenchyma, they are covered with white spots of 25 μ in diameter, farther apart on the coenenchyma. The interpolypar distance is 1.25 mm., which value may diminish to 1.1 mm. The length of the sagittal tentacles, which are inserted at a lower level, is 0.35 mm.; the lateral ones are 0.3 mm. long and the proximal pair predominates slightly over the distal pair. — The dome-shaped oral cone has a diameter of 220 μ and is 180 μ high; the diameter of the round or somewhat sagittally elongated mouth is 55 μ.


Fig. 67. *Euantipathes ericoides* (M. Edw.) em. Polyps on the top of a branch; 14 ×.

In some polyps the mesenterial filaments are visible through the body wall (fig. 67).

The specimen of station Banda is broken in two parts, which however belong together, as is shown by the spines and the mode of branching. The basal part, 8 cm. high, 6 cm. broad and 4.5 cm. thick, has an irregular basal plate and a stem, which is unbranched over 0.75 cm., and somewhat curved. At this point the stem is branched in a number of equivalent branches, which are branched themselves in all directions, with very frequent fusions to dense meshes. All branches are curved upwards. There are no polyps; the spines are the same as in the other specimen; their length is 90 μ, diminishing on the older parts; mutual distance: 240 μ. There are 4 (—5) longitudinal rows, forming a quincunx.

The top-part of the colony, which is only part of the complete top, is 8 cm. high, 4 cm. broad and 4 cm. thick. In every respect this fragment is the same as the basal part, but that the branches are finer and lighter brown. There are 5 longitudinal rows of spines.

Both specimens I have identified with *Arachnopathes ericoides* M. Edw. as Brook has described it, although there are some differences: the ultimate branches are not placed in a spiral, but irregularly; their mutual distance is greater than Brook's data "about six or eight to a centimetre"; the number of longitudinal rows of spines is somewhat less. — As to the spiral distribution of the branches, Brook himself refers to some Copenhague specimens where this spiral distribution is lacking. The other details of the description are very like those of these specimens, e. g. the shape and the dimensions of the spines, the mode of branching, the irregular increase of the diameter of the principal branches here and there, the fusions, even

of the ultimate branches, etc. For the present I think it will be desirable to join BROOK's *Arachnopathes aculeata* to *Arachnopathes ericoides*, since the differences, mentioned by BROOK, appear to me as only of a qualitative value, e. g. the somewhat less frequent fusions of the branches, the tendency of the branches to be inserted on one special side of the branch of lower order (also to be remarked in both Siboga-specimens), the double spiral distribution of the spines (also present in both Siboga-specimens), the somewhat smaller spines, which are sharper, etc. In many of these points the Siboga-specimens occupy an intermediate position between both of BROOK's species. — *Arachnopathes clathrata* M. Edw. is too imperfectly described to permit a decision to be taken on the relationship of this species and *Euantipathes ericoides*, but the difference is certainly not very great (cf. BROOK's figures of the spines). At various points this species is like *Euantipathes dichotoma*, but the very frequent fusions, even between the ultimate branches, make a different type of it, although it is to be remarked that this is no very great difference and that various specimens of *Euantipathes dichotoma* may be regarded as transitions, e. g. XXVII, XXV, XIX, XXXI and XXXV, which in the here-given order show an increasing number of fusions, but always in the older parts of the colony and never to such a high degree as in this species. — It is not necessary to keep the genus *Arachnopathes* M. Edw. intact, since the mode of branching is not so very typical, as is demonstrated by the colonies of *Euantipathes dichotoma*, which also show fusions, while the fact that the branches are fused into a mass, several centimetres in thickness instead of being flat, can surely be of no generic value, since colonies of very different genera show also a non-flat shape, near other species of the same genera which are flat. — The polyps, described here for the first time, leave no doubt as to their being in accordance with the *Euantipathes*-polyp-type.

Diagnosis:

COLONY: densely branched and through numerous fusions fused into a dense mass. No principal stem, but several equivalent branches, subvertically growing and presenting dilations without regularity. All branches curved upwards; angle of insertion 60° to 90°. Ultimate branchlets arranged spirally or irregularly. The branches have a tendency to an unilateral arrangement.

SPINES: slightly distally inclined; concave distal side, convex proximal side; smooth; 4—5 longitudinal rows and quincunx. Length 90—120 μ, distance 240—270 μ.

POLYPS: arranged in a single series, but not on a special side of the colony: rare or absent on the older parts. Interpolypar distance 1.1—1.25 mm. Sagittal tentacles 0.35 mm. long; proximal lateral ones (0.3 mm.) slightly predominating. Dome-shaped oral cone with round or somewhat sagittally elongated mouth.

9. *Euantipathes*? *curvata* sp. n. (Pl. VIII, fig. 5).

Merauke, Dutch South New Guinea. 1 spec.

This dried colony, collected by Dr. J. W. R. KOCH, is fixed with an irregular basal plate.

The stem is only very short (1 cm.) and thick (1.25 cm.); it is immediately branched to a high degree in three principal branches and a number of lesser ones, which all of them are densely branched themselves. Everywhere the axis tapers gradually. The entire colony is firm and shrublike in shape, with a length of 0.5 m. and a greatest breadth of 0.6 m., which is found in the upper part of the colony. Although at first the branches are directed towards every side, there are two parallel planes to be seen, so that the colony is a thick plate, 1 dm. thick. There are no fusions between the branches, although on some places the coenenchyma of neighbouring branches is adhering. The lesser branches are for the greater part inserted bilaterally, and on a great part of the colony even unilaterally, however without letting their planes coincide exactly with the principal plane of the colony. The branches are inserted at an angle which varies from 45° to 90°. The ultimate branches, the length of which is about 5 cm., are slender and often curved in a rather high degree, so that I have called this species curvata. They give the entire colony a rather confused appearance. The polyps, which are dried to an unrecognisable mass, are found especially on one side of the colony.

The spines (fig. 68) have their distal side straight or concave, inclined distally at a rather variable degree; their proximal side is concave at its base, convex at the top. Sometimes the entire spine is sinuous. They are arranged in 7 longitudinal rows, which alternate in a quincunx, which is often irregular or slanting. The mutual distance varies from 240 to 280 μ; their length (110 μ) is equal on all sides of the axis. Many spines show a tendency to doubling their apex, while also excrescences may occur on the distal side as well as on the proximal side of the spines. The surface of the spines may have little warts in a great number on their base and on their apex.

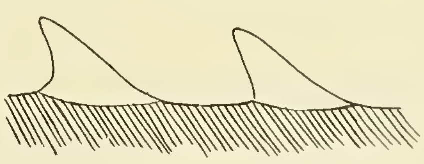

Fig. 68. *Euantipathes? curvata* sp. n. Spines; 92.6 ×.

Diagnosis:

Colony: densely branched in one or more parallel flat planes; ultimate branches arranged bi- or unilaterally, nearly in the colony-plane, so that the colony has a marked thickness. — Firm. — Ultimate branches ± 5 cm.; angle of insertion 45°—90°; slender and curved (or sinuous).

Spines: distally inclined; concave distal side, convex and concave proximal side; surface smooth or provided with little excrescences on base and apex; 7 longitudinal rows and quincunx; mutual distance 240—280 μ; length 110 μ, equal on all sides. (Often deformations.)

Polyps: shape unknown; on one side of the colony.

2nd Subgenus *Aphanipathes* (Br.) emend.

1. *Aphanipathes Sibogae* sp. n. (Pl. VIII, fig. 2).

Stat. 80. 2° 25' S., 117° 43' E. Borneo-bank. 50—40 M. Fine coralsand. 1 spec.

This colony, a very fine specimen and covered with well-preserved polyps, is more than 30 cm. in height, and is branched in a plane. The basal diameter of the stem is 2.5 mm.; as early as 0.75 cm. above the base a very dense branching begins, without much regularity, except

that all the branches, within rather large bounds, lie in a plane. However there are also branches, which are inserted in such a manner as to make a thick plate of the colony, rather than a thin plane, a mode of branching which is more or less like the former genus *Arachnopathes* M. Edw. Especially the branches of higher order are entirely irregular in their distribution and direction, except as to the angle at which they are inserted. — There are vere frequent fusions between neighbouring branches, in all parts of the colony even between the ultimate branches. In this manner an entangled mass of rather thin branches is formed. The degree of branching increases towards the top of the colony, so that the thickness of the colony is several cm. Usually the branches are inserted at right angles or almost at right angles with the branch of lower order. Very often the branches are curved, except the ultimate ones, which are usually straight. The length of these ultimate branches varies from a few mm. to 1 cm. — The diameter of the axis in the lower part of the colony diminishes very swiftly so that some free ending branches are spine-shaped, but in the higher part of the colony the axis tapers much more slowly.

The spines (fig. 69) are inserted almost at right angles with the axis; their distal side is almost straight, the proximal side is rather curved. Near the top of the spine the diameter diminishes at once very much, and the top-part itself is sometimes slightly distally inclined. The mutual distance of the spines varies from 330 μ to 450 μ, but this value is always the same on one part of the axis, so that the regular distribution is not disarranged. There are four longitudinal rows and a very regular straight quincunx. The length, subequal on all sides, is 150 μ.; the surface of the spines is smooth. There is no increase of the length of the spines in the neighbourhood of the polyps. They perforate the coenenchyma easily and usually the polyps also; often the spines are visible in the oral cavity (polyp on the right branch of fig. 70).

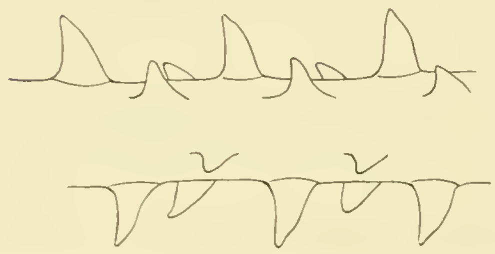

Fig. 69. *Aphanipathes Sibogae* sp. n. Spines on an ultimate branch; 52 ×.

The polyps (figs. 70, 71, 72, 73) are white, and visible to the naked eye as thick, white knobs on the lightbrown axis, just like in Brook's genus *Tylopathes*. They are placed in a single series, on one side of the axis, usually all of them on one side of the colony. — The length of the tentacles is 0.3 mm., and except for the lower level at which the sagittal tentacles are inserted there is no great difference between sagittal and lateral ones. The oral cone is rather low with a wide open mouth, the border of which is irregular, or which is shut and almost invisible (indicated by dotted lines in the figures). In the latter case the oral cone itself is also

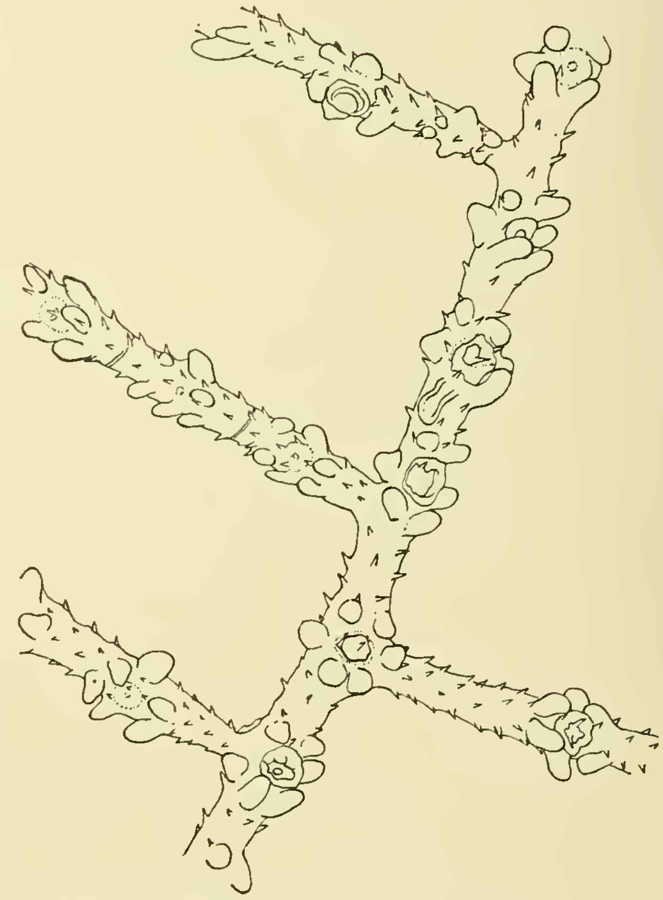

Fig. 70. *Aphanipathes Sibogae* sp. n. Polyps on the ultimate branches; 14 ×.

almost flat and invisible. The diameter of the mouth, opened, is 0.2 mm. — The interpolypar distance is 0.3 mm., which value is rather variable; on the ultimate branches the polyps are somewhat more crowded. Between the polyps the transversal groove in the coemenchyma is often clearly visible (figs. 70, 72). The thin coemenchyma is transparent milkwhite with numerous opaque white spots, 30—40 μ in diameter. The surface of the tentacles is covered with warts but the spots are only very seldom separately visible.

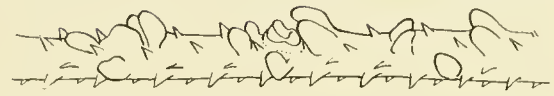

Fig. 71. *Aphanipathes Sibogae* sp. n. Polyps on the ultimate branches; 14 ×.

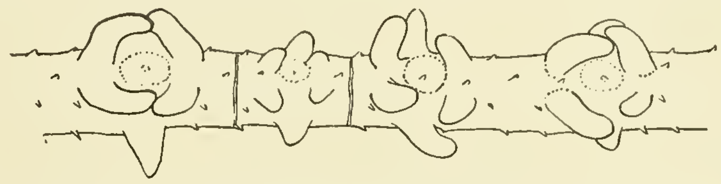

Fig. 72. *Aphanipathes Sibogae* sp. n. Polyps on one of the basal fusions; 14 ×.

On the older parts of the colony there is no degeneration of the polyps to be observed. It is true that the mouth is often shut and the oral cone flat, but there are without any doubt numerous polyps on this basal parts, which are in every respect like those on the younger branches; the tentacles are even longer and larger than on the younger parts of the colony. Only the number of the polyps is diminished. — On the older parts even young polyps occur between the adult ones (fig. 72). The warts and the white spots are less clear and the spines are shorter. — On many parts of the older branches the longitudinal groove on the back of the polyps is still clearly visible.

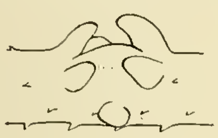

Fig. 73. *Aphanipathes Sibogae* sp. n. Polyp on one of the basal fusions; 14 ×.

Diagnosis:

Colony: densely branched, in a thick plate; stem very swiftly tapering, branches not. Angles of 90° between the branches. Very frequent fusions in all parts. Ultimate branches straight, others curved.

Spines: at right angles with the axis, with smooth surface; 4 longitudinal rows. Mutual distance 330—450 μ. Length 150 μ.

Polyps: length of cylindrical tentacles 0.3 mm., all subequal. Rather low oral cone; mouth irregularly round. Interpolypar distance ± 0.3 mm.

2. *Aphanipathes undulata* sp. n. (Pl. VIII, fig. 8).

Stat. 305. Solor-strait. 113 M. Stony bottom. 1 spec.

This fanshaped colony, branched in a plane, is complete. Height 20 cm.; greatest breadth 35 cm. The branching begins immediately at the base itself, where three equivalent stems originate, the middle one of which is only 14 cm. long, while both the others are much longer. A fourth stem, properly speaking a basal branch of the right stem, is snapped off at a length of a few cm. The middle stem has a basal diameter of 3 mm.; the other ones respectively 4.5 and 5.5 mm. This last ones are repeatedly branched before showing the same mode of branching as the middle stem. — The stems are sinuous; the branches are not inserted in a regular manner, except for their lying in the same plane as the stems. Often the larger branches are inserted especially on the convex side of the branch which bears them, but this is not the rule. The greatest number of the

larger branches, which are very conspicuous, are composed, properly speaking, of a number of branches of always higher order, since the at once swiftly tapering branch is continued in diameter and direction by the branch of higher order, about in the same manner as in a dichasium. In this manner an explication is given of the sinuousness of the stems, since at every moment the branch of higher order must curve before it can follow the principal direction. — The branches are inserted at an angle of over 45°; on their further course they are curved towards the top of the colony; this curving occurs principally in the basal part of the branch; even the ultimate branches, which are a few mm. to 0.5 cm. long, are always somewhat curved. The angle of insertion of the ultimate branches often approaches to 90°. They have a rather big appearance with a swiftly tapering top; at their base they are somewhat constricted, also the branches of lower order, which gives a typical aspect to the colony (figs. 75, 76). There are no fusions between the branches in any part of the colony. — The spines (fig. 74) are very long and slender and their surface is entirely smooth but with a narrow diaphragma and greatly magnified a very fine granulation is visible, which easily escapes our notice. The length is 375 μ to 450 μ and even more, varying without regularity;

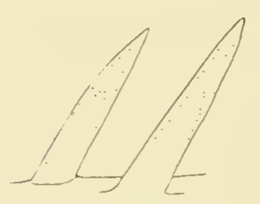

Fig. 74. *Aphanipathes undulata* sp. n. Spines; 52 ×.

Fig. 75. *Aphanipathes undulata* sp. n. Polyps; 14 ×.

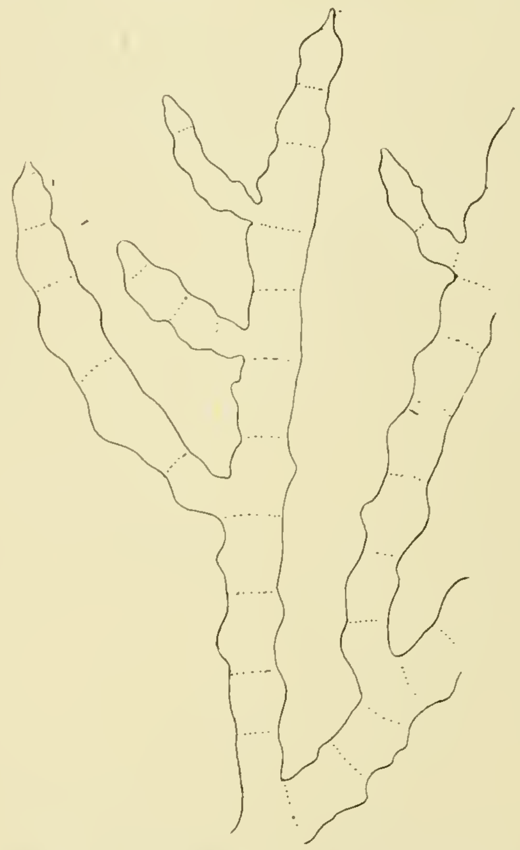

Fig. 76. *Aphanipathes undulata* sp. n. Part of the colony to show the successive swellings; the dotted lines approximately give the polypar limits; 7.5 ×.

larger and smaller spines are intermingled, without preference for a special side of the axis. In the polypar areas the spines are distinctly longer and more heavily built. Sometimes the spines are arranged in rows and a quincunx, but usually this regularity is entirely absent. — The mutual distance of the spines varies from 150 μ to 225 μ; they are distally inclined, ensiform, sometimes with a slightly sinuous top. Near the top of the branch the spines are already fully

developed; they perforate the coenenchyma and the polyps very far (fig. 75). The entire colony is covered with polyps (figs. 75, 76), which are brownish (the effect of the many perforating spines!), just like the coenenchyma. To the naked eye the polyps are to be discerned as somewhat thicker points on the axis, alternating with slight constrictions. They are placed in a single series, always on the same side of the colony. The oral cone and the tentacles can only be discerned as low, knobby swellings of the coenenchyma, between the spines. The oral cone is round and dome-shaped, with a small round mouth, which is very rarely visible. The interpolypar distance is 1.1 mm., which value is variable. The diameter of the oral cone is 0.3 mm. The tentacles are at an equal or subequal distance from the oral cone. When the spines perforate the centra of oral cone or tentacles, only their apex is visible; between these parts they are for a greater part visible; from this it is evident that the polyps are rather large cushions on the axis. The coenenchyma shows lighter, more opaque spots. Seen from the back of the colony the swellings of the polyps are conspicuous, as is visible in fig. 76, where the limits of the polyps are given in dotted lines.

In many points this species has the character of Brook's *Aphanipathes*, but the mouth is not sagittally elongated and the oval shape of the polyps is not very apparent. — As to the mode of branching this species appertains to Brook's "Section II", but the lack of fusions makes it appertain to his "Section I". Probably *Aphanipathes? humilis* (Pourt.) is nearly related to this species, but the mode of branching of *Aphanipathes undulata* is so typical that it would certainly have been noted by Pourtalès in his descriptions.

Diagnosis:

Colony: Fanshaped; branched from the base; principal branches or stems sinuous, dichasial. Angle of 45° between the branches, increasing to 90° at the ultimate branches, which are a few mm. to 0.5 cm. long. Branches curved towards the top of the colony, in their basal part; constricted at their base. No fusions.

Spines: Ensiform, distally inclined, nearly smooth, 375—450 μ; irregularly distributed at a mutual distance of 150—225 μ. Longer and more heavily built in the polypar areas.

Polyps: Domeshaped, low oral cone with round small mouth. Tentacles radiate, knobshaped. Interpolypar distance 1.1 mm. Placed on one side of the colony.

3. *Aphanipathes indistincta* sp. n.

Stat. 144. Anchorage North of Salomakiëe-(Damar-)island. 45 M. Coral and Lithothamnion. 1 spec.

This specimen is a fragment of a colony, which was branched to a high degree in every direction. The almost straight stem is 3 cm. long; the branches are placed on all sides on varying distances of a few mm. to over 0.5 cm. They leave the stem at an angle of 60° to nearly 90°; on their further course they are slightly bent upwards. Secondary and tertiary branches occur also, with the same characteristics. Sometimes, but far from frequently, fusions

occur between neighbouring ultimate branches. These ultimate branches are a few mm. to 0.75 cm. long; they are almost straight. The spines (fig. 77) have a convex proximal side and a concave distal side, which may be almost straight. The length of the spines is different on opposite sides of the axis, viz. 125 μ. and 105 μ.; it is remarkable that the longest spines are placed on the non-polyp-bearing side of the axis. Their mutual distance is 300 μ. There are 5 longitudinal rows, alternating in a somewhat slanting, but regular quincunx. The surface of the spines is smooth. The polyps, which are more conspicuous than in the former species (figs. 78, 79), are transparent or opaque-white, just as the coenenchyma. The interpolypar distance is about 1.25 mm. The sagittal tentacles are 0.35 mm. long; the proximal lateral ones are 0.3 mm. and predominate over the distal pair in a rather high degree. The polyps, which are placed in a single series, do not prefer a special side of the colony. The oral cone is round and low (or entirely flat), with slanting sides and a round mouth (fig. 79). The spines perforate the coenenchyma and the polyps, but this is caused more by the flatness and the transparency of the polyps than by the length of the spines, which is not so very great. So this species is a transition from the typical *Aphanipathes*-species towards the other subgenus *Euantipathes*, and for this reason I called it *indistincta*. The mode of branching is in some points like that of *Arachnopathes aculeata* Br., but since the polyps are wholly lacking and there are several differences in spine-characters, I shall keep this species for the present apart.

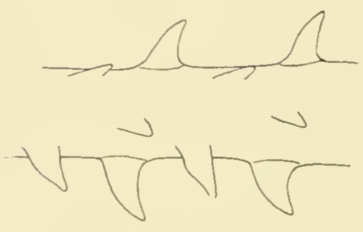

Fig. 77. *Aphanipathes indistincta* sp. n. Spines: 52 ×.

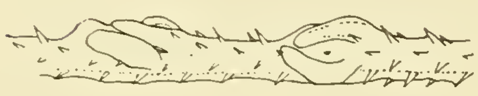

Fig. 78. *Aphanipathes indistincta* sp. n. Polyps; 15.75 ×.

Fig. 79. *Aphanipathes indistincta* sp. n. Polyp; 15.75 ×.

Diagnosis:

Colony: Branched in every direction, at angles of 60°—90°; distance between the branches a few mm. to 0.5 cm. Rare fusions. Length of the ultimate, straight, branches max. 0.75 cm.

Spines: Smooth, somewhat distally inclined, convex proximal and concave distal side; length 125 and 105 μ.; distance in the 5 longitudinal rows: 300 μ.

Polyps: Transparent. Predominating proximal lateral tentacles (0.3 mm.). Interpolypar distance 1.25 mm. Low, round oral cone with round mouth.

4. *Aphanipathes reticulata* sp. n.

Stat. 301. 10° 38′ S., 123° 25′.2 E. Pepela-bay, East coast of Rotti-island. 27—45 M. Mud, coral and Lithothamnion. 1 spec.

This specimen, which is in a rolled-up condition gives the impression of having acquired this shape through the preservation bottle. The habitus indicates that it is a fragment of a colony which was branched in a plane, possibly somewhat sinuous. There are a number of principal branches to be distinguished, all of which are secondarily branched. All of them are

slightly curved; only the ultimate branches are straight or very nearly so. The mutual distance of the branches is irregular (2—4 mm.); the angle, at which they are inserted, is almost 90° or 60°—90°. Very frequent fusions occur between the branches of every order. The branches of every order are always inserted laterally or sligthly antero-laterally. The length of the ultimate branches is a few mm. to 0.5 cm.

The spines (fig. 80) are long, aculeate and somewhat sinuous; their surface is practically smooth, but the top bears a little number of small knobs. The spines are somewhat distally inclined, and arranged in 6 longitudinal rows and a slanting quincunx, which remains regular on the older parts of the colony. Their mutual distance is 300 μ, which value is somewhat variable. There is a great difference in length on opposite sides of the axis, viz. 270 μ and 120 μ. They project very far through the coenenchyma and the polyps. The length of the spines varies for neighbouring spines but never to such an extent that the spines are shorter in the interzoöidal areas.

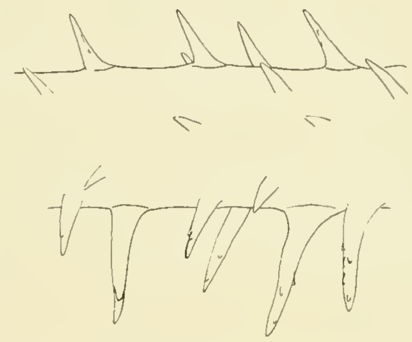

Fig. 80. *Aphanipathes reticulata* sp. n. Spines; 52 ×.

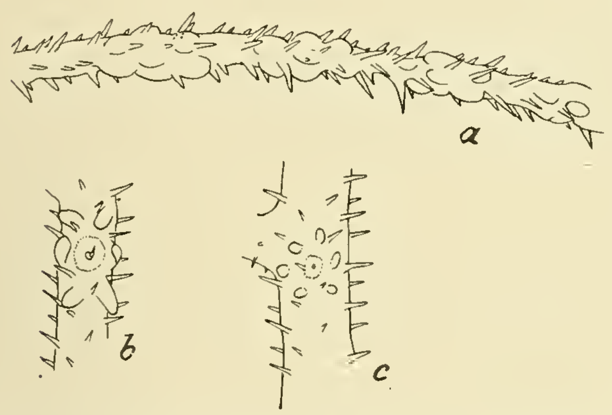

Fig. 81. *Aphanipathes reticulata* sp. n. *a* Polyps on ultimate branch; *b* polyp on an older branch, *c* polyp on a principal. branch; *a*, *b*, *c* 14 ×.

The polyps (figs. 81, 82) are principally placed on one side of the colony; on the principal branches they may be found on both sides of the axis, but on the ultimate branches we very rarely find the polyps on the back of the colony. On the ultimate branches the polyps are mostly only visible as swellings of the coenenchyma (fig. 81 *a*) with indistinct tentacular circumferences. — On the principal branches (fig. 81 *b*, *c*) the polyps are more distinct with much longer, cylindrical tentacles and a very low oral cone, with a small round mouth. On the branches of higher order the polyps are somewhat transversally elongated, which is visible in fig. 81 *b*, but on the principal branches the tentacles are radiate (fig. 81 *c*). The spines project for a considerable distance through the polyps. — The colour of the polyps is milkwhite to light yellowbrown. The interpolypar distance is ± 1 mm.; the length of the tentacles is 0.15 mm.; the diameter of the oral cone is 0.2 mm. None of the described *Aphanipathes*-species is to be identified with this species; the figures of the polyps given by Pourtalès of *Aphanipathes humilis* and *Aphanipathes thyoides* are very like the polyps of this species but the mode of branching is entirely different.

Fig. 82. *Aphanipathes reticulata* sp. n. Polyp on ultimate branch; 21 ×.

Diagnosis:

Colony: Branched in a plane. All branches slightly curved, except the ultimate branches; mutual distance 2 to 4 mm.; length a few mm. to 0.5 cm.; angle 60° to 90°. Frequent fusions in all parts of the colony.

Spines: Long, aculeate, sinuous, smooth with knobs on the apex, distally inclined; 6 longitudinal rows. Distance 300 μ. Length 270 μ and 120 μ.

Polyps: Inconspicuous; on one side of the colony, in a single series. Radiate or slightly transversally elongated. Interpolypar distance 1 mm. Length of tentacles 0.15 mm. Low oral cone with round, small mouth.

5. *Aphanipathes pennacea* (Pall.) Brook.

Aphanipathes? pennacea Pall. Brook, Anthipatharia. Chall. Rep., p. 129, pl. XI, fig. 23.
Antipathes pennacea Pall. Pallas, El. Zooph., p. 209; Lamouroux, Polyp. flex., p. 379; Encycl. méthod., p. 71; Dana, Zooph., p. 582; Milne-Edwards, Coralliaires, t. 1, p. 318.
Antipathes pluma Gray. Gray. Proc. Zool. Soc. London 1857, p. 291.

Stat. 52. 9° 3'.4 S., 119° 56'.7 E. Savu-sea. 959 M. Globigerina ooze. 1 spec.
Stat. 90. 1° 17'.5 N., 118° 53' E. Makassar-straits. 281 M. Coral sand and stones. 1 spec.
Stat. 91. Muaras-reef (East coast of Borneo). Up to 54 M. Hard coral sand. 1 spec.
Stat. 95. 5° 43'.5 N., 119° 40' E. Sulu-sea. 522 M. Stony bottom. 1 spec.
Stat. 301. 10° 38' S., 123° 25'.2 E. Pepela-bay, East coast of Rotti-island. 27—45 M. Mud, coral and Lithothamnion. 1 spec.

The colony of station 301 is a complete specimen with a stem of ± 7 cm., in its first part curved, but further straight. It tapers swiftly; the top is snapped off. There are two rows of branches, one on the right, one on the left. One branch in each row is very large and thick; both are curved sligthly upwards and snapped off after a few cm. The branches alternate regularly to the right and to the left; the mutual distance in a row is ± 2 mm. Some branches bear secondary branches, which alternate as regularly in two rows, although irregularities are rather frequent. Some tertiary branches occur, which alternate regularly or are arranged wholly irregular. All the branches lie in a plane, with very rare exceptions. The angle between the branches is always more than 60° or slightly less. Fusions are entirely absent. The branches of higher order are straight; the ultimate branches are 1—3 mm. long.

The spines (fig. 83) are arranged in 4 longitudinal rows, alternating in a straight quincunx. On the ultimate branches the length of the spines is 105 μ. and 75 μ. on opposite sides of the axis; their mutual distance is 170 μ. On the stem the distribution of the spines is irregular, while they are somewhat longer. On the ultimate branches the spines are inclined distally (fig. 83 *a*) with a concave distal side and a convex proximal side; the tophalf of their surface is rough, while the base is smooth. On the stem (fig. 83 *b*) they are inserted more upright on the axis and their shape is more slender, thinner and more aculeate. On the top of the stem and on some ultimate branches the spines are also more aculeate.

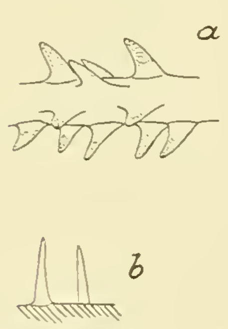

Fig. 83. *Aphanipathes pennacea* (Pall.) Brook. *a* Spines on smaller branch; *b* spines on the stem: *a*, *b* 52 ×.

The polyps (fig. 84) are badly preserved and rare; they are found only on one side of the axis. On the branchlets the polyps have knob-shaped tentacles, and a round oral cone; the spines project through both this parts of the polyps. The colour is milk-white; the interpolypar distance is 1 mm.; the tentacles are arranged in two rows. — On the stem only oral apertures are found, but no tentacles; beside this degenerated polyps no normal ones are present on the stem.

Fig. 84. *Aphanipathes pennacea* (Pall.) Brook. Polyp on a smaller branch; 21 ×.

The fragmentary specimen of station 90 is branched in a plane, with a straight stem

of 0.75 cm., and 4 right- and 5 leftbranches, straight, 2.5—3 mm. long and nearly at right angles with the axis, or directed somewhat distally, alternating regularly, except the last ones. Mutual distance in a row: ± 2 mm.; the rare secondary branches are arranged in the same manner. Polyps unknown; the spines (fig. 85) are everywhere arranged in 4 longitudinal rows and a quincunx. Mutual distance is about 240 μ; length 105 μ and 70 μ on opposite sides of the axis; the short spines are smooth, with their distal side at right angles with the axis; the long ones have a number of short protuberances on their top. On the top of the branches the spines are sometimes entirely smooth.

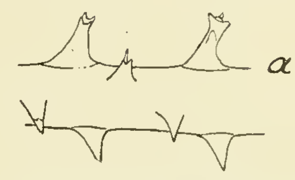

Fig. 85. *Aphanipathes pennacea* (Pall.) Brook. Spines on a smaller branch; 52 ×.

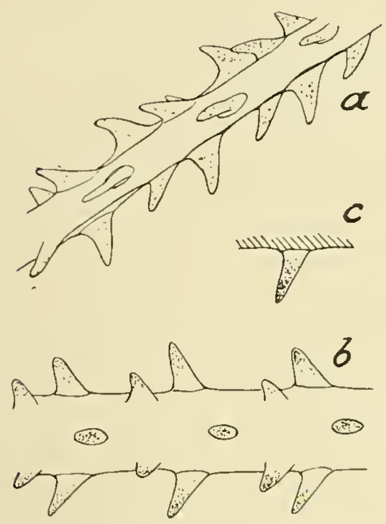

Fig. 86. *Aphanipathes pennacea* (Pall.) Brook. *a* Spines on a smaller branch; *b* spines on a larger branch; *c* spines on the stem; *a*, *b*, *c* 52 ×.

The specimen of station 95 has the same mode of branching as the specimen of station 301, with only slight differences; all the branches are straight or slightly sinuous, and often inserted antero-laterally, with a mutual distance of 3 mm. in a row. No polyps. Spines in 4 (—5) longitudinal rows, and a straight quincunx; their surface, except a part of their base, is granulated (fig. 86*a*). Mutual distance 300 μ; length 105 μ, equal on all sides of the axis. On the larger branches the spines are less distally inclined (fig. 86*b*); on the stem the spines are more slender (fig. 86*c*) and sparingly distributed, without much regularity.

The fragment of station 91, without polyps, has a straight stem of 2.25 cm.; the branches, inserted at angles of 60°—90° alternate regularly to the right and to the left in two rows, but now and again there are branches, which diverge from this rule. The planes of the two rows are at an angle of ± 100°. — The mutual distance in a row is ± 2.5 mm.; the right branches are 1.5 cm., the left ones 0.5 cm. long. Secondary branches of a few mm. occur sparingly, always in one single row, directed straight forwards. The spines (fig. 87) are smooth, distally inclined, rather blunt; their mutual distance is 185 μ, their length 90 μ, subequal on all sides of the axis. There are 4 longitudinal rows and a straight quincunx. Sometimes the rows are curved and doubled, but not often. On the older parts the distribution becomes more and more irregular and more scarce; proximally inclined spines occur here between the normal ones, and also many deformations of the spines.

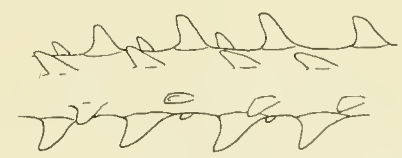

Fig. 87. *Aphanipathes pennacea* (Pall.) Brook. Spines; 52 ×.

The fragment of station 52 has a straight stem of 1.5 cm., with branches which lie nearly in a plane, with exceptions in all directions. Mutual distance in a row 2—3 mm.; length ± 0.5 cm.; angle of insertion 60°(—45°). Secondary branches in two rows, alternating regularly to the right and to the left, with a mutual distance of more than 2 mm. in a row and a length of ± 0.5 cm. The plane of this rows is at right angles with the plane of the colony, with some exceptions. All the branches bear ultimate branchlets of a few mm., at an angle of 45°, directed towards the front of the colony, or upwards. — The spines (fig. 88*a*) have a finely granulated top; mutual distance 165 μ; length 90 μ and 75 μ on opposite sides of the axis. There are

STATION OR SPECIES	number of long. rows of spines	length of the spines	mutual distance of the spines	irregularly distributed spines on the stem	surface of the spines	shape of the spines on the younger branches	ditto on the older parts of the colony	branches alternate regularly	branches in a plane	ultimate branches in the plane of the colony	branches are straight	angle of insertion of the branches	angle of insertion of the ultimate branches	REMARKS
I. 52	4 and q. (5 on the stem)	90 μ and 75 μ	165 μ	no (or very slightly)	top granulated, on all parts of the colony	inclined distally; concave distal side	inclined distally; aculeate	yes	no	no (directed forwards)	yes	(45°—) 60°	45°	
II. 90	4 and q.	105 μ and 70 μ	± 240 μ	no [1])	top with protuberances (also on the stem) or entirely smooth	inclined distally; (sometimes vertical distal side)	as on the younger branches [1])	yes	yes	yes	yes	nearly 90°	nearly 90°	1) this fragment has only young branches.
III. 91	4 and q.	90 μ	185 μ	yes	smooth	as in station 52	as on the younger branches; deformations occur	yes	no	no (in one single row forwards)	yes	60°—90°	60°—90°	
IV. 95	4(—5) and q.	105 μ	300 μ	yes	top granulated, also on the stem	as in station 52	more upright on the axis	yes	no	no (somewhat antero-laterally)	yes (or somewhat sinuous)	80°	80°	
V. 301	4 and q.	105 μ and 75 μ	170 μ	yes	top granulated; not on the stem	as in station 52	more upright on the axis; aculeate	yes	yes	yes	yes	more than 60°	over 60°	
VI. *Aphanipathes pennacea* (Pall.) BROOK	4—5 dextr. spir.	210 μ	200 μ—230 μ	?	smooth (?)	as in station 52 (basal constriction)	?	yes	no	yes	yes	?	?	These data are deduced from BROOK's figures and description. Possibly a fine granulation was present on the surface of the spines, but this point is undecided.

4 longitudinal rows and a quincunx; on the older parts the regularity is intact but there are 5 longitudinal rows and the spines are more aculeate (fig. 88 *b*). On the base of the stem an irregular distribution occurs, but no deformations of the spines.

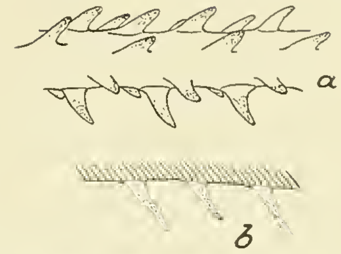

Fig. 88. *Aphanipathes pennacea* (Pall.) Brook. *a* Spines on a smaller branch; *b* spines on a principal branch; *a*, *b* 52 ×.

The specimen of station 301 was first taken by me for a basal part of *Aphanipathes reticulata* sp. n. but the typical regular mode of branching, the shape of the spines, their dimensions, surface, number of longitudinal rows, the absence of fusions, etc., make it not possible, in the absence of further material, to unite both species. — The mode of branching is very like Brook's description of *Aphanipathes pennacea* Pall. except a slight difference in the shape of the spines and their dimensions, but the other specimens are often the necessary transitions between both. As on former occasions, I have given a review of the characteristics of all specimens in a tabel, to compare them with Pallas' species. This tabel demonstrates that the deviations, which may occur in some specimens, partly are present in a lesser degree in other specimens, partly are of too small a weight to annihilate the conspicuous likeness in the other characteristics. — I prefer to combine all described specimens with Pallas' *Aphanipathes pennacea*, the *Aphanipathes*-character of which is not very conspicuous, and the diagnosis of which is as follows:

Colony: Branches in two rows, alternating regularly to the right and to the left; in most cases nearly in the same plane except often the ultimate branches; inserted at angles of 45°—90°; straight. Mutual distance a few mm. No fusions.

Spines: Distally inclined; concave distal side, convex proximal side; length 70—210 μ.; mutual distance 165—230 μ.; surface usually granulated, except on the base of the spine; sometimes entirely smooth or with protuberances on the top. Aculeate on the older parts of the colony and more upright.

Polyps: Tentacles knob-shaped; arranged in two rows (probably not on the older parts, but here the polyps are degenerated). Round, low oral cone. Interpolypar distance 1 mm.

Former habitat: Pallas, East Indies; Brook, (Brit. Mus.) St. Helena.

6. *Aphanipathes cancellata* Brook.

Aphanipathes cancellata Br. Brook. Antipatharia, Chall. Rep., p. 133, pl. III, figs. 5—9.
Aphanipathes hancocki F.-C. Forster-Cooper, Antipatharia (Percy Sl. Tr. Exp.), p. 312, fig. 8.

Merauke. Dutch South New Guinea. 1 spec.

This dried specimen, collected by Dr. I. W. R. Koch, is an oval fragment of a colony, with a long axis of 40 cm. and a short axis of 30 cm. There are no principal branches to be descried. The mode of branching is the same as in Brook's specimen; there are frequent fusions to a close-set reticulum. All the branches are curved or sinuous. Only the ultimate ones are straight and free; their length is ± 0.5 cm. The colony is branched in a plane but there are many dents and curves in this plane. Right across the colony-plane, along the long axis, an other

plane is inserted at an angle of over 60°. — The polyps are dried to an unrecognisable layer. The spines (fig. 89), on the younger parts of the ultimate branches, are conical with a rather blunt apex, slightly distally inclined or nearly at right angles with the axis. Their length is 70 μ, sub-equal on all sides of the axis: they are arranged in 5—6 longitudinal rows, which sometimes are rather irregular so that a quincunx is not always clearly visible; however there is usually a straight quincunx. The mutual distance in a row is 230—240 μ. The surface of the spines is only very slightly granulated. — On the older parts of the ultimate branches, and on all other branches the spines are always inserted at right angles with the axis, while their surface is entirely smooth or only slightly granulated. Their mutual distance is somewhat lessened (200 μ).

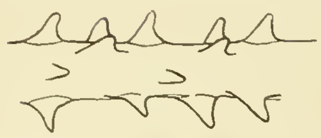
Fig. 89. *Aphanipathes cancellata* Brook. Spines: 52 ×.

The mode of branching leaves no doubt about the identification of this specimen with Brook's *Aphanipathes cancellata*. However the spines are slightly divergent; in Brook's specimen they are sharper, while their surface is covered with small sharp-pointed processes almost to their base. The number of rows (6) is the same; their dimensions are rather divergent; from Brook's figures I deduce a length of 200 μ and a mutual distance of nearly 400 μ. But in view of the great variability of this characters in other species and genera I dare not keep this specimen apart on ground of these differences.

Even if Brook's dimensions of the spines are right, this *Aphanipathes*-species is a doubtful one, since the polyps, figured by Brook, are only in a slight degree perforated by the spines; probably this form is a transition between the two sub-genera *Aphanipathes* and *Euantipathes*, just like *Aphanipathes pennacea* (Pall.) Brook. — Forster-Cooper's *Aph.*? *hancocki* which, according to this author, approaches *Aph. cancellata* closely in method of growth, differs from it in having smoother and longer spines, but in view of the slightly granulated spines of the Siboga-specimen, which are intermediate between Brook's species and F. Cooper's species, I am of opinion that this slight difference is not great enough to keep both species apart.

Former habitat. Brook 5° 49′ 15″ S., 132° 14′ 15″ E., 140 fm.; F. Cooper Salomon Atoll (Chagos) 75 fm.

Parantipathes (Brook) emend.

1. *Parantipathes columnaris* (Duch.) Brook.

Parantipathes? *columnaris* (Duch.). Brook, Antipatharia, Chall. Rep., p. 145; Silberfeld, Japanische Antipatharien, p. 28.
Arachnopathes columnaris Duch. Duchassaing, Rev. d. Zooph. e. d. Spong. d. Antilles, p. 23.
Antipathes columnaris Pourt. Pourtalès, Cat. Mus. Comp. Zool., pt. VIII, 1874; pl. IX, fig. 8; Bull. Mus. Comp. Zool. 1878, p. 209; 1880, p. 117, pl. III, fig. 3.

Stat. 262. 5° 53′.8 S., 132° 48′.8 E. Between Kei-islands. 560 M. Solid bluish grey mud. 1 spec.
Stat. 267. 5° 54′ S., 132° 56′.7 E. Arafura-sea. 984 M. Grey mud. 2 spec.

One of the specimens of station 267 is 15.5 cm. long; the first 3 cm. of the stem are covered with broken stumps; the basal fixation is missing. The rest of the axis is densely branched. The length of the branches is subequal (max. 1.4 cm.) except in the basal- and the

toppart of the colony. The curved colony is somewhat laterally compressed; the greatest breadth is 3 cm., the smallest breadth, on the same level, is 1.5 cm.; the toppart is blunt. A worm-tube lies against the stem, almost from the base to the top of the colony. — The branches are not arranged in regular longitudinal rows, except sometimes for a short space. Their variable mutual distance is ± 3 mm. Many branches are simple, especially on the two flat sides of the colony. On the other sides many branches are branched. While the primary branches are almost at right angles with the axis, with some exceptions which are distally inclined, the secondary branches are curved towards the outside of the colony. Tertiary branches occur also. The secondary branches diminish in length towards the top of the primary ones, and usually they are not arranged in longitudinal rows but in verticils of 3 to 4; their bases, in the same verticil, are not always on the same level; the members of one verticil are not always equal in length. The tertiary branches are also arranged in verticils if they are present in a sufficient number. — Frequent fusions occur between neighbouring branches, not only of the coenenchyma, but also of the axis itself.

On the top of the branches, which is separated from the rest of the branch by a sudden diminuation of the diameter, the smooth spines are arranged in longitudinal rows, without further regularity. Their mutual distance is 300 μ; they are triangular with a concave distal side (fig. 90 *a*). On the slightly larger parts of the axis the longitudinal rows have disappeared, so that the distribution is wholly irregular, especially since the mutual distance is very variable (fig. 90 *b*); sometimes short longitudinal rows put in appearance but never for a great distance. The spines are here more blunt and their base broadens gradually and imperceptibly into the axis. There is no difference in length between the spines of opposite sides of the axis, but there is a difference in shape (fig. 91). The round knobs are situated on the polyp-bearing side of the axis. The length of the spines is 50 μ; their mutual distance is at least 225 μ. If there is any regularity in the distribution, there are 4—5 longitudinal rows, with a mutual distance of 375 μ between the spines. But the larger the branch, the more irregular is the distribution of the spines; their length diminishes and many spines disappear. — The axial lumen is very small (20 μ). The polyps (figs. 92, 93) may occur on every side of the primary branches, but not in a series, and on the outward side of the branches of a higher order, in a single series. The tentacles are short: 180 μ; the oral cone is very low, flat and broad, with a transversal diameter of 440 μ; the sagittal diameter is slightly less. The mouth is almost round. The tentacles are nearly radiate; on the larger branches the distance between the sagittal tentacles and the middle of the mouth is 375 μ, and 450 μ between the lateral tentacles and the middle of the mouth. So there is a tendency to a transversal elongation, which on the larger branches is not so conspicuous as on the thinner branches, where the polyps are very elongated (fig. 93), as is necessary in

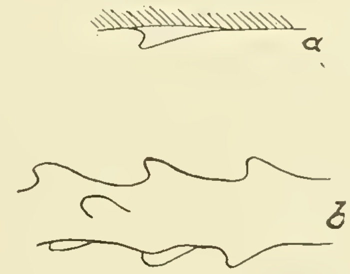

Fig. 90. *Parantipathes columnaris* (Duch.) Brook. *a* Spine on the ultimate top of a branch; *b* spines on the lower part of an ultimate branch; *a*, *b* 52 ×.

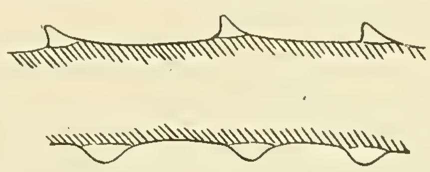

Fig. 91. *Parantipathes columnaris* (Duch.) Brook. Spines on opposite sides of a branch; 52 ×.

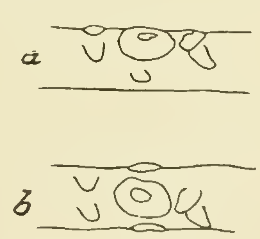

Fig. 92. *Parantipathes columnaris* (Duch.) Brook. *a*, *b* Polyp on a rather thick branch; *a*, *b* 14 ×.

the *Parantipathes*-type. The proportion of the transversal and the sagittal axis of the polyps is as 3 : 1 or 4 : 1. The oral cone is in its distal and proximal part higher than in the middle (as is the case in *Sibopathes*). The mouth is also transversally elongated. The length of the tentacles is 150—225 μ.; the distance between the lateral pairs of tentacles of two neighbourring polyps is 0.6 mm.

Fig. 93. *Parantipathes columnaris* (Duch.) Brook. Two polyps on a ultimate branch; 14 ×.

The wormtube is composed out of colony-branches, without any additions from the Annelid itself. It is formed by numerous connections between the branches; these connections are subparallel with the stem; they have secondary connections, which are at right angles with the stem. In this manner a rather regular meshwork results, which however on some places looses its regularity. The stem is included into the wall of the tube, the diameter of which is 0.5 cm. The meshes are covered with polyps but, in contradiction to Brook, I found these polyps not more crowded on the walls of the tube than on the other parts of the colony; and besides, all polyps were placed on the o u t s i d e of the wormtube. There are several Annelids assembled in the lower half of the tube, while the upper half is empty. The distribution and the number of the polyps on the wall of the tube make it not probable that we have here a case of symbiosis; it gives rather the impression of a case of commensalism. — According to Brook's description of more crowded polyps on the tube, it would be possible to look upon it as a case of symbiosis.

The second specimen of the same station is in every respect like the other one, except that the shape of the slightly curved colony is cylindrical; diameter 2.5 cm.; length 14.5 cm. The wormtube ends at a distance of 1 cm. below the top. The branches, which act as support to the wormtube are directed distally upwards, but further on they are inserted at right angles with the stem.

The specimen of station 262 is in a dried condition; the polyps form a lightgray covering of the jetblack axis. The basal plate is large and follows every irregularity of the underground. The first part of the stem is curved in a quadrant; the further part is slightly sinuous. The basal diameter is 3.5 mm.; the length of the colony is 12.5 cm. The first 2 cm. are unbranched, the rest is branched. On one side of the axis the length of the branches increases from 0.5 to 2.75 cm., to diminish only slightly further on. On the other side of the axis the length of the branches increases after 8 cm. to a length of max. 1.5 cm. After these 8 cm. the stem dissolves into a densely branched crown with three curved principal branches, all of them branched in the same manner as the stem in the other specimens, except that the long branches are branched to an exceedingly higher degree. The wormtube is placed on the side of the long branches and ends at the beginning of the branched crown. There are many fusions between branches and branchlets. — The spines (fig. 94) are arranged in 4—5 almost regular, longitudinal rows, without further regularity. The mutual distance of the spines varies from 180 to 300 μ. The shape of the spines is somewhat larger than in the other specimens,

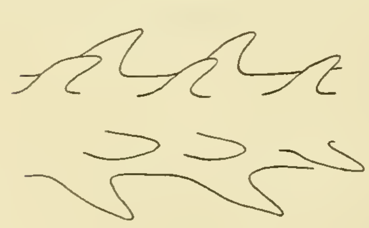

Fig. 94. *Parantipathes columnaris* (Duch.) Brook. Spines on a smaller branch; 52 ×.

viz. 135 μ., equal on all sides of the axis. On the larger branches the regularity of the distribution disappears; on the stem the spines are very rare. The Annelids, 4 or 5 in number, have left the tube and are twined around and between the branches.

The description of *Parantipathes columnaris* Duch. by Brook is in almost every point like that of the Siboga-specimens, except that in the latter ones the principal branches are not placed in verticils, and that the spines are not always so very short. The transversally elongated mouth is not very well in accordance with the sagittally elongated mouth in Brook's generic diagnosis of *Parantipathes*, but, next to the variability of the mouthslit in other species, it should be kept in mind that it is more probable that an elongation of the polyp in a transversal direction, as it is shown by these specimens, is more often accompanied by a transversally elongated mouth than by a sagittally elongated mouth. Perhaps it will be better to omit the shape of the mouth from the generic diagnosis.

Diagnosis:

Colony: Bottle-brush-type. Branches in verticils or irregularly distributed on all sides. Secondary and tertiary branches in verticils. Stem visible throughout the entire colony or in its top-part dissolved in branches. Frequent fusions. Wormtubes composed out of a regular network of connections, parallel or at right angles with the stem. Stem included in the wall of the tube.

Spines: 4—5 longitudinal rows on the youngest part of the ultimate branches; on the older parts entirely irregular distribution. Mutual distance 180—375 μ. Length 50—135 μ., equal on all sides of the axis. Smooth; distally inclined.

Polyps: Slightly elongated on the older branches, much elongated on the younger branches. Tentacles max. length 225 μ. Interpolypar distance max. 2.1 mm. Oval oral cone, higher in its distal and in its proximal part. Mouth transversally elongated.

Former habitat. Duchassaing: Guadeloupe, 35—50 fm.; Pourtalès: Martinique, Dominica, Virgin Gorda, St. Lucia, St. Vincent, Grenadines, Barbados, Guadeloupe (16 stations on depth of 73—861 fm.); Silberfeld: Amerika.

2. *Parantipathes* (?) *tristicha* sp. n.

Stat. 173. 3° 27′ S., 131° 0′.5 E. Ceram-sea. 567 M. Fine, yellow grey mud. 1 spec.

This complete colony has a small, inconspicuous, basal plate. The height of the colony is 9 cm. The first 0.7 cm. is unbranched; the rest is very regularly branched. The basal diameter of the stem is 550 μ., which value increases slightly, before it tapers gradually towards the top. The stem is nearly straight and only very slightly curved backwards. — In the first place there are two longitudinal rows of branches (fig. 95, *1*), alternating regularly to the right and to the left. In the lower half of the colony both rows of branches are lying in the same plane, but in the higher part of the colony their planes are at an obtuse angle of 130°, on the concave side of the colony. The length of these entirely unbranched

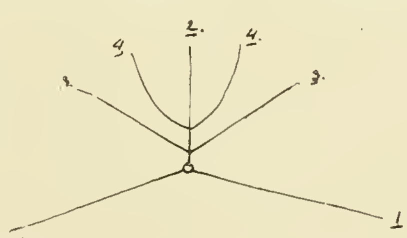

Fig. 95. *Parantipathes* (?) *tristicha* sp. n. Horizontal projection of the branches (schema).

branches is ± 1 cm., except the lowest ones; they are inserted at an angle of 45° (fig. 96, *1*), distally inclined and straight. At the side of both these rows there is a tertiary row on the middle of the convex side of the colony (figs. 95 and 96, *2*), which row is at equal angles with the other rows, so that in the top-part of the colony, the three rows are equidistant. The branches of this third row are inserted at right angles with the axis, except the lower ones, which are distally inclined at an angle of nearly 60°. — These branches are inserted at the level of the branches of both the other rows, so that the number of these branches is double the number of the branches in the other rows. The branches are branched themselves (figs. 95 and 96), so that all the secondary branches of one and the same branch lie in a plane, which intersects the plane of the simple branches in a line at right angles with the stem. Since nearly all the branches of this row are subequal in length (0.5 cm.) and straight, and since the secondary branches are very regular, the whole colony has a very regular appearance. The secondary branches are grouped in two pairs. The lowest pair (figs. 95 and 96, *3*) is 0.5 cm. long and these branches are straight; the highest pair, inserted at a 0.75 mm. higher level, is 3 mm. long and curved towards the outside of the colony (fig. 95, *4*). Often the branches of one pair do not lie in the same plane; in this case there is an obtuse angle between them on the distal side. — There are no polyps. The spines are blunt knobs, 80 μ. long, with a mutual distance of 150 μ., on the base of the colony (fig. 97*a*), where they leave one side of the axis (the concave side of the colony) entirely smooth; there are three longitudinal rows, with some sparingly distributed spines on the transition zone towards the smooth half of the axis-circumference. Where the branched part of the axis begins, the spines are more acute, but they are small (fig. 97*b*) and placed on a kind of longitudinal crests, which wind in a very steep spiral around the stem; on the top of the stem there are 6 longitudinal rows, with a distance of 165—300 μ. between the spines. On the branches (fig. 97*c*) the length of the spines is 225 μ. and 130 μ.; the longest ones are placed on the distal side of the branches. The spines are more acute and distally inclined, while the base of the spines is very elongated. There are 4 longitudinal rows, with a distance of 600—750 μ. between the spines. The surface of the spines is entirely smooth. The absence of the polyps makes it difficult to decide to which genus this species appertains, but in view of the mode of branching, I put it in the genus *Parantipathes*, in expectation of a better determination. It is not to be denied that the two rows of simple branches, nearly in the same plane, the double-numbered row of branched branches, which are to be compared with the two rows of short branches, and the presence of longitudinal crests at the base of the spines, are points which this specimen has in common with *Eubathypathes quadribrachiata* Brook. The spines are entirely unlike the very widely distributed type of spine of *Eubathypathes*, but without doubt

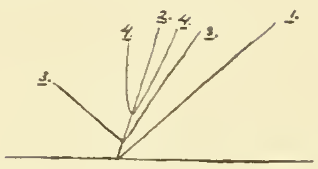

Fig. 96. *Parantipathes* (?) *tristicha* sp. n. Lateral view of the branches (schema).

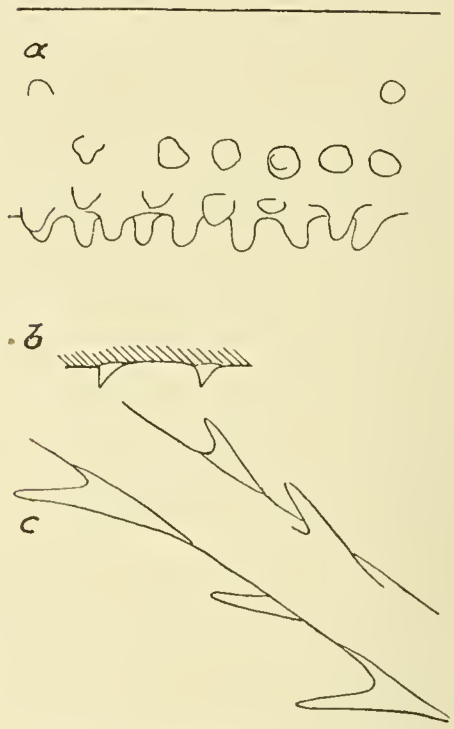

Fig. 97. *Parantipathes* (?) *tristicha* sp. n. *a* Spines on the base of the colony; *b* spines on the top of the stem; *c* spines on an ultimate branch; *a*, *b*, *c* 52 ×.

the relation between this species and *Eubathypathes* (especially *Eub. quadribr.*) is very near.

Diagnosis:

Colony: Two rows of simple branches, nearly in a plane, and a third double-numbered row of branched branches. For mode of branching cf. figs. 97 and 98.

Spines: On the branches: distally inclined, smooth, acute, with an elongated base, in 4 longitudinal rows; length 225 μ and 130 μ, mutual distance 600—750 μ. On the stem: knob-shaped, at right angles with the axis; max. 80 μ; distance 150 μ; 3 longitudinal rows, but one half of the axis is smooth; spines often forming longitudinal crests.

Polyps: Unknown.

3. *Parantipathes tenuispina* Silberfeld.

Parantipathes tenuispina Silb. SILBERFELD, Japanische Antipatharien, p. 20, Taf. I, fig. 4.

Stat. 289. 9° 0'.3 S., 126° 24'.5 E. Timor-sea. 112 M. Mud, sand and shells. 1 spec.

This specimen, 13 cm. long, is curved and sinuous. The basal plate is not sharply defined and follows the irregularities of the underground. The stem is branched over its entire length, but in the higher part the branching is more dense. On a height of 2 cm. sits a branch of 6 cm. length. The branches have a more blunt top than in *Parantipathes columnaris.* — The basal diameter of the stem is 0.75 mm., which increases to 1 mm. on a height of 4 cm. Then the diameter remains subequal, to diminish at the top. The large branch is subequal in diameter, viz. 0.75 mm. over its entire length. As to the other branches, they are nearly all of them simple; only a few have secondary branches, small in number and irregularly distributed. The primary branches are directed towards every side, always nearly at right angles with the stem. In their further course they are straight or slightly curved. The average length is 1.5 cm. on the side of the wormtube, and more than 1 cm. on the other side of the stem; so the exterior side of this tube marks the virtual axis of the colony. The branches are crowded without regularity; they give to the colony a cylindrical shape with a diameter of 2.5 cm. and a blunt apex.

The large branch bears many broken branches at right angles, and ditto secondary branches.

The wormtube only follows the stem over the last 8 cm.; there are several Annelids assembled in the upper half of the tube, except the last 2.5 cm. The diameter of the tube is 4 mm.; its walls are built in the same manner as those of *Parantipathes columnaris*, with alternately regular and irregular structure.

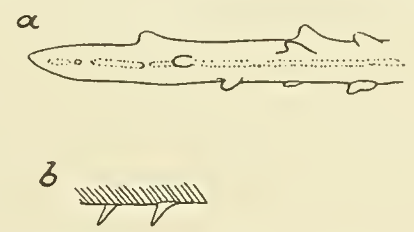

Fig. 98. *Parantipathes tenuispina* Silb. *a* Spines on the top of a branch; *b* Spines on the base of a branch; *a*, *b* 52 ×.

The spines (fig. 98 *a*) on the top of the branches are blunt, and become only more acute (fig. 98 *b*) on a little distance from the top. They are irregularly distributed; sometimes 4 longitudinal rows are indicated, but only for a short distance. In such a row the mutual distance is more than 400 μ; otherwise this value is very variable. On the stem the distribution is entirely irregular.

The polyps (figs. 99, 100), which are almost invisible to the naked eye, are placed on the distal side of the branches; young polyps are interpolated between the adult ones. The interpolypar distance is 1.25 mm. The round oral cone, with slanting sides, has a small, round mouth. The tentacles are knob-shaped; the sagittal ones are inserted at a lower level than the lateral ones. On the stem the tentacles show a radiate arrangement, but the polyps are decidedly elongated on the younger branches where the proportion between the transversal and the sagittal axis of the polyps is as 4 : 1. On the wormtube the polyps only sit on the outside; perhaps they are somewhat more crowded than on other parts of the colony, but at any rate this difference is not very conspicuous.

Fig. 99. *Parantipathes tenuispina* Silb. Polyps on an ultimate branch. 15.75 ×.

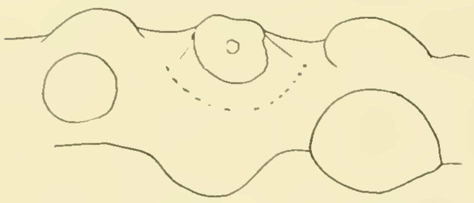

Fig. 100. *Parantipathes tenuispina* Silb. One of the polyps of fig. 99; 52 ×.

Although the proportion of the axes of the polyps on the older parts of the colony is as 1 : 1, I have kept this species in the genus *Parantipathes*, since the mode of branching and the polyps on the younger branches are so very like the characteristics of *Parantipathes*, but without doubt the polyps are inclined towards the *Euantipathes*-type, so that this species is an intermediate form between both genera. — There are some points in common with *Parantipathes larix* Esper but the secondary branches, the irregular distribution of the primary branches, etc. induced me to keep them apart.

Diagnosis:

COLONY: Cylindrically shaped with obtuse apex. Entirely branched towards every side. Branches distributed irregularly, mostly simple, some of them branched in the same manner. Rare fusions. Wormtube of the same pattern as in *Parantipathes columnaris*.

SPINES: Blunt on the top of the branch; on the other parts acute. Irregularly distributed with fragmentary longitudinal rows (4—6). Mutual distance very variable, about 400 μ. Smooth surface. Length: max. 108 μ.

POLYPS: Small and inconspicuous. Radiate on the older parts, elongated (4 : 1) on the branches. Tentacles knob-shaped. Oral cone round with slanting sides and small, round mouth. Interpolypar distance 1—1.25 mm.

Former habitat. SILBERFELD: Sagami-bay (Japan) 200 M.

4. *Parantipathes larix* (Esper) Brook.

Parantipathes larix (Esper). BROOK, Antipatharia, Chall. Rep., p. 142, pl. XII, fig. 20; pl. XIII. fig. 2; pl. XV, fig. 1. Syn. cf. BROOK; HICKSON, The Alcyonaria etc. (Journ. Mar. Biol. Ass., vol. VIII, n° 1); THOMSON, Note on a large Antipatharian from the Faeroes (Proc. R. Phys. Soc. Ed., vol. XVII).

Stat. 95. 5°43'.5 N., 119°40' E. Sulu-sea. 522 M. Stony bottom. 1 spec.

This specimen only is a fragment of a colony, but the characteristic points are easily discernible. The colony is 4 cm. long, straight and cylindrical, with a diameter of 1.5 cm. The

polyps are entirely absent. Along the stem of the entire fragment a wormtube is visible. All the branches are simple; they are sub-equal in length, viz. 8 mm. (in one half of the colony the branches are very much damaged). All the branches are straight and inserted at right angles with the axis, directed towards all sides, but a distribution in six longitudinal rows is visible. The wormtube is of the same pattern as in the other described *Parantipathes*-species, and the stem is included in its wall. The diameter of the tube is 2.5 mm.; Annelids are absent.

The spines (fig. 101) on the tops of the branches are arranged in 4 longitudinal rows, alternating in a slanting quincunx. The length of the spines is 65 μ.; their mutual distance is 210 μ.; the spines are smooth, distally inclined and slightly curved. On the stem and the wall of the wormtube the spines are at right angles with the axis, while their distribution is not so regular. Their mutual distance is 150 μ. or less; often there are 4(—5) longitudinal rows visible with quincunxial alternation, especially on the stem; length: 60 μ.

Fig. 101. *Parantipathes larix* (Esper) Brook. Spines on the top-part of a branch; 52 ×.

Although the number of branches in a longitudinal row is greater than in Brook's description, the arrangement of the branches, the shape and distribution of the spines are concordant with Brook's description and the figures of Lacaze Duthiers. The more crowded branches in the longitudinal rows are no great objection to the identification with Brook's species for the specimen, described by J. A. Thomson from the Faeroes, has more than 20 branches in a vertical row, on a space of 3 cm., while Brook gives this number as 11; the Siboga-specimen keeps the middle between both. Besides Thomson's specimen has also the not entirely regular arrangement in six longitudinal rows, which, in the Siboga-specimen, is no objection to combine it with Brook's species, where this arrangement is entirely regular. Thomson's remark about the flexibility of the pinnulae is here also true. Although in Thomson's specimen, as well as in the Siboga-specimens, the polyps are unknown, I have no doubt as to the identity, mentioned above, also of Thomson's specimen. The diagnosis should be emendated as follows:

Colony: Stem may be branched. Stem or branches bear unbranched pinnulae, in bottle-brush-arrangement, principally in 6 vertical rows with slight deviations. Number of pinnulae in a row: 4—7 on 1 cm. Pinnulae straight, but flexible, at right angles with the stem.

Spines: Triangular on the older parts of the colony, distally inclined on the pinnulae. Smooth, acute; 3—4 longitudinal rows; length 60—90 μ.; mutual distance 150—210 μ. (Brook: 300 μ.; Thomson: 500—750 μ.).

Polyps: Tentacles slender and elongated, arranged in two rows; transversal polypar axis 3—4 × sagittal axis; mouth somewhat sagittally elongated on a round oral cone. Interpolypar distance more than 2 mm.

Former habitat. Esper, Lacaze Duthiers, Mediterranean; Brook, Bay of Naples, 54 fm.; Milne Edwards, Duchassaing, Martinique; Roule, Bay of Gascony, 1220 M.; Hickson, station 13 (48° 7′ N., 8° 13′ W. 412 fm.); Thomson, Faeroes.

5. *Parantipathes laricides* sp. n.

Stat. 170. 3° 37'.7 S., 131° 26'.4 E. Arafura-sea. 924 M. Fine grey mud. 1 spec.

The natural base of this colony, which is 7 cm. long and slightly curved, is lacking. The basal diameter of the stem is 285 μ and tapers gradually towards the top. The entire stem bears branches, 1.25—1.75 cm. long, except on the last 2 cm. of the colony, where they diminish in length; some branches are longer, through the very long, slender top. They are inserted at an angle of 67.5°, which in the basal part of the colony is nearer 90°. All the branches are straight, or very rarely somewhat distally curved, and always simple. There are 6 longitudinal rows of branches, the planes of which are at subequal angles with one another. Every three rows are inserted at nearly the same level on the stem; each number of three alternates rather regularly with the preceding and the following group of three (cf. fig. 102, *a*). The opposite members of two succeeding groups of three lie in the same plane, so that three planes in all can be brought through the branches (fig. 102, *b*). The mutual distance between two succeeding groups of three on the same side of the axis is ± 3.5 mm., which value diminishes towards the top of the colony. Sometimes very slight deviations occur in this very regular arrangement through the omitting of a branch. — The spines (fig. 103) on the branches are distributed in 3 longitudinal rows; their length is 55 μ and 10 μ on opposite sides of the axis; the mutual distance is ± 255 μ, but as this value is very variable, the rather regular quincunx often disappears. The smooth spines are triangular with a vertical distal side; the short spines are knob-shaped. On the slender top of the branches (fig. 103, *b*) the spines are somewhat irregular in contour; on the stem there are still regular longitudinal rows, 4 in number.

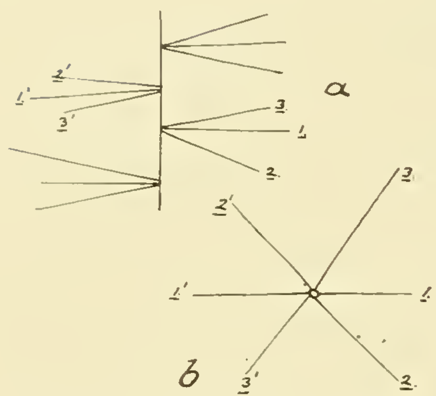

Fig. 102. *Parantipathes laricides* sp. n. *a* Lateral view of the branches; *b* horizontal projection of the branches; (schemata).

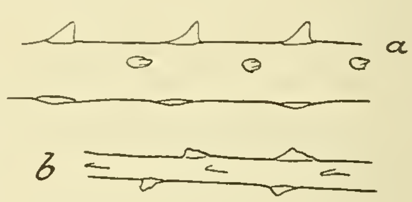

Fig. 103. *Parantipathes laricides* sp. n. *a* Spines on an ultimate branch; *b* spines on the top of a branch; *a*, *b* 52 ×.

The polyps are almost entirely lacking; on one single branch there are rests of a polyp visible, the tentacles of which are very like the most distal polyp of *Parantipathes columnaris*; the pairs of tentacles are far apart; length of the tentacles 525 μ; the distance between the sagittal and lateral pair of tentacles is 1 mm., and 1.75 mm. between the lateral pairs of neighbouring polyps. There are indications of a rather elongated oral cone, the transversal basal diameter of which is over 0.75 mm.

On the stem there are also some polyps (fig. 104), with a high domeshaped oral cone with an almost round mouth, and a diameter of 525 μ and a height of 225 μ. The tentacles are thick and knob-shaped. These polyps are still rather elongated in a transversal direction; often the oral cone has a greater diameter in its top-part than on half of its height. — Generally the tentacles are of a more heavy built than in *Parantipathes*

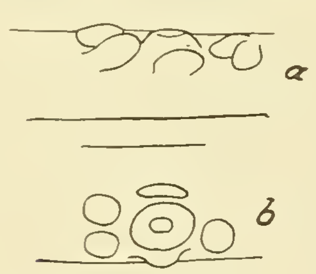

Fig. 104. *Parantipathes laricides* *a*, *b* Polyps on the stem: *b* 14 ×. One of the lateral tentacles in *b* could not be made out.

columnaris, while the oral cone is different in shape. — The very regular arrangement of the pinnulae in numbers of three and some deviations in polyps and spines, are an objection to identify this specimen with *Parantipathes larix*, although both forms are near relations, so that perhaps the Siboga-specimen is only a variety, as more extensive material might demonstrate.

Diagnosis:

Colony: Stem bears 6 rows of straight or slightly curved pinnulae in groups of three, alternating regularly (cf. fig. 104). Angle of insertion 67.5° or more. No wormtubes.

Spines: 3—4 longitudinal rows; length 10 and 55 μ; mutual distance ± 255 μ; smooth, triangular, distal side at right angles with the axis.

Polyps: Ditto as in *Par. columnaris*. Tentacles: length 525 μ. Intertentacular distance (on the pinnulae) 2.75 mm. Oral cone elongated transversally. On the stem: mouth round, oral cone domeshaped, slightly elongated; tentacles knob-shaped.

Cirripathes (Br.) emend.

1st Subgenus *Stichopathes* Br.

CRITICAL REVIEW OF THE KNOWN SPECIES.

Out of the large number of species, described by other authors, I have retained the following species, after having combined many species, basing on the given descriptions. However I do not mean to say that the identification is irrefutable. The principal aim is to get a survey of the wellnigh unmanageable material, collected untill now. A full list of species is given by Silberfeld, wherein only *Stichopathes gracilis* Gray var. α Sch. is lacking.

1. *Stichopathes gracilis* Gray, to which I joined *Stichopathes pourtalesi* Brook; *Stichopathes gracilis* Gray var. *spiralis* T. & S., var. α Schultze, *Stichopathes occidentalis* Gray; *Stichopathes echinulata* Brook; *Stichopathes indica* Schultze and *Stichopathes setacea* Gray.

The type of *Stichopathes gracilis* Gray has a slender, sinuous stem, which, according to Brook, is never wound in a spiral, but, according to Schultze, is partly a spiral, while Johnson (9) finds an irregular loose spiral in two specimens. The stem is 2 m. long with a basal diameter of 2.5 mm. The spines are arranged in 6—9 longitudinal rows, ± 200 μ long, with a mutual distance of 600—1000 μ; they are inserted at right angles with the axis, triangular in shape and sometimes forked at the top; surface: rough.

The polyps are not described, since they are dried. *Stichopathes pourtalesi* Brook deviates from *Stich. gracilis* Gray in the shape of the colony and in some characteristics of the spines. Its colony is a sinistrorsal or dextrorsal spiral, while the spines are arranged in 5—6 longitudinal rows, over 75 μ long, at a mutual distance of 600—1000 μ; their apex is sometimes forked, which may even pass off into a doubling of the spines. The shape of the spines is at one time conical, at another triangular, so there is no great choice between them. These

differences, rather slight as they are, diminish still more by comparing the varieties *α* Schultze and *spiralis* T. and S. with the species under discussion. While *Stich. pourtalesi* Br. has a spiral colony, *Stich. grac.* var. *α* has regular spirals, *Stich. grac.* var. *spiralis* is at first straight, afterwards sinuous and ends with a spiral top, and at last has *Stich. gracilis* Gray, according to Brook, no spiral colony and according to Schultze a partly spiral colony. We have here a complete series of transitions from a spiral to a non-spiral colony; I think it not feasible to mark a limit. The same holds true for the spinal characteristics. The number of longitudinal rows is 5—6 in *Stich. pourtalesi*, 6—9 in *Stich. gracilis* Gray, 7 in its var. *α*, 5—9 in its var. *spiralis* (on one and the same colony!), so that in the last variety the extreme values of *Stich. pourtalesi* and *gracilis* are present. — The length of the spines is a too variable character to act as a specific distinctive as is demonstrated not only by *Stichopathes variabilis* n. n. but also by the greater number of described species out of the Siboga-material. The mutual distance of the spines, also very variable in most cases, is 300 μ in *Stich. pourtalesi* (deduced from Pourtalès' figures) and 1000 μ in *Stich. gracilis* Gray (deduced from Brook's figures), but it is a fact that this value especially in *Stich. pourtalesi* is not entirely to be confided in since Pourtalès' figures are very small and in my opinion give more the habitus and not precisely all the characteristics accurately. So there is no weighty argument to keep *Stich. pourtalesi* and *Stich. gracilis* apart. Even if all species, mentioned here above as joined to *Stich. gracilis* Gray should be left intact as good species, I would, without any doubt, join *Stich. pourtalesi* and the varieties *α* and *spiralis* to *Stich. gracilis* Gray, under a somewhat wider diagnosis, e. g. colony: spiral or partly spiral with straight base, sometimes sinuous, some meters long; spines: 5—9 longitudinal rows, laterally compressed, triangular or conical, distance ± 1000 μ; polyps: one series, large and prominent, distance 1.5—3 mm., well developed oral cone, very long tentacles, sometimes shorter (through preservation?), with swollen base. — Since in *Stich. gracilis* Gray var. *α* Schultze the smooth and slender spines are given as a variety-character, together with the spiral stem, it must be remarked that the spines are not so very slender; out of the figures given by Brook for. *Stich. gracilis* Gray a length of ± 200 μ may be deduced for the spines, while in var. *α* this length is 190 μ — 220 μ. — The smoothness of the spines is not so very remarkable, if the joining of the species, mentioned about, holds true, since *Stich. pourtalesi* Brook has also smooth spines and since var. *spiralis* T. and S. has probably also smooth spines. — The only specimen in existence of *Stichopathes occidentalis* Gray has a slender, whiplike, non-spiral colony, 2.74 m. long with a basal diameter of 2 mm. while *Stich. pourtalesi* Brook has a spiral stem. Besides there are differences in the spines; *Stich. occidentalis* has 6—10 longitudinal rows against 5—6 in *Stich. pourtalesi*; the spines of *Stich. occidentalis* are small and conical, and in *Stich. pourtalesi* small and triangular. Since these characters of the spines are usually very variable, the differences, mentioned here, are not sufficient to keep *Stich. occidentalis* intact as a species; I will join it to *Stich. pourtalesi* Br. and via this species to *Stich. gracilis* Gray. The mutual distance of 600 μ between the spines of *Stich. occidentalis* are at the same time a very useful transition from the smaller distance in *Stich. pourtalesi* towards the larger one in *Stich. gracilis* Gray. — Of *Stichopathes echinulata* Br. there exists also only one single specimen, and Brook himself remarks that the type of spines is

very much like that of *Stich. occidentalis* Gray. The form of the colony is almost the same in both species, viz. "elongate, slender, distinctly tapering" in *Stich. echinulata* Br. and "long, very slender, and tapering" in *Stich. occidentalis* Gray. Both are 1 m. long or more. The number of longitudinal rows of spines is 9—10 in *Stich. echinulata* (while F. Cooper figures 7 longitudinal rows for this species), and 6—10 in *Stich. occidentalis*, according to Brook's figure. So the conformity of both species is too great and the differences are too small to keep them apart. Via *Stich. occidentalis*, *Stich. echinulata* is joined to *Stich. gracilis* Gray. The polyps of *Stich. echinulata* and *occidentalis* are unknown. — The polyps on the four colonies of *Stichopathes indica* Sch. are in a bad condition, so that only their uniserial arrangement is to be discerned. The diagnosis is: spiral colony, length of the spines ± 300 μ, 5—7 longitudinal rows, mutual distance of the spines 600—900 μ (measured in Schultze's figure), conical, slightly distally inclined, sometimes different in length on opposite sides of the axis. On comparing this species with *Stich. occidentalis* and *Stich. echinulata*, we find, as far as some characters of the spines are concerned:

Stich. indica Sch.	length of spines	300 μ;	distance 1000 μ;	rows 5—7
Stich. echinulata Br.	„ „ „	190 μ;	„ 750 μ;	„ 9—10
Stich. occidentalis Gray	„ „ „	190 μ;	„ ± 575 μ;	„ (6—)10.

Tracing these data I am inclined to consider *Stich. echinulata* as a transition from *Stich. indica* towards *Stich. occidentalis*. — The shape of the colony is in accordance with the spiral colony of *Stich. pourtalesi*. In my opinion there are points of communication enough to join *Stich. indica* via these species to *Stich. gracilis* Gray. — J. Y. Johnson separated *Stichopathes setacea* Gray from *Stichopathes gracilis* (Gray) Brook with which it was joined by Brook, but on comparing the description of Johnson's specimen with the following diagnosis there is no reason to keep them separated. Johnson's remark that the specimen from the Canary Islands, described by Alcide d'Orbigny, is either *Stichopathes setacea* or a young specimen of *Stichopathes gracilis* Gray demonstrates that the difference is clearly very slight. The polyps are unknown. The diagnosis of this latter species, after its combining with the discussed species, should be emendated as follows:

Colony: sinuous or partly or entirely spiral, several meters long, with a basal diameter of a few mm.; slender, regularly tapering; sometimes growing in groups.

Spines: 5—10 longitudinal rows (usually 6—7); length 75—220 μ (usually ± 200 μ); mutual distance 300—1000 μ (usually ± 900 μ); triangular or conical, at right angles with the axis or slightly distally inclined; smooth or rough surface.

Polyps: large and conspicuous, very long tentacles, swollen at their base (Pourtalès, figs. 24, 25); well developed oral cone with transversally elongated mouth; proximal lateral tentacles predominate; interpolypar distance 2 mm. (variable). Tentacles may be shorter and more rigid through preservation? (cf. Schultze's Pl. XIV, fig. 15 in **11**).

2. *Stichopathes? desbonni* D. & M. The most characteristic quality of this species is that it has its spines arranged in verticils. Since this species grows in groups, of a dozen colonies each, the number of specimens is large enough not to see a casual arrangement in these verticils. Although the rest of the description is very vague, I am inclined to keep this species intact for the present; especially since the polyps are entirely unknown, the specific diagnosis is rather vague. The character of the stem, given by BROOK as: "hollow near the apex", is a character which holds good for every Antipatharian. The diagnosis is:

COLONY: slender, straight or slightly curved, but never spiral; length max. 70 cm. with a basal diameter of 1.5 mm.

SPINES: 10 longitudinal rows; mutual distance 330 μ; triangular, distally inclined, or a blunt cone at right angles with the axis; smooth surface?.

POLYPS: unknown.

3. *Stichopathes variabilis* n. n. (= SILBERFELD's spec. of *Stichopathes filiformis* Gray). I am of opinion that SILBERFELD's specimen of *Stichopathes filiformis* (Gray) Brook should be made into a new species, since the identification of this specimen with BROOK's specimen is not well possible. It is a pity, as is the case in more descriptions of SILBERFELD, that the length and the diameter of the colony are not given, since the proportion of both is important enough for the habitus of the colony, although perhaps the absolute measures themselves can not be used as specific differences. In contrast with the everywhere equal diameter, as BROOK describes it for *Stichopathes filiformis*, SILBERFELD's specimen is of a very unequal thickness, at one time diminishing regularly, at another increasing for some distance in higher parts of the colony, at another diminishing swiftly, just as I have described in a large group of the Siboga-material (cf. *Stichopathes variabilis* n. n.), but never in all parts subequal in diameter. — The spines are arranged in a somewhat smaller number of rows (6—7); they are shorter, viz. 175 μ max.; they are of different length on opposite sides of the axis; their mutual distance is much less, viz. 225—325 μ, which value however, measured after my method, would be somewhat larger ($\pm$ 400—425 μ), but in any case much below the value in BROOK's figures. The spines may have a forked apex, which is not mentioned by BROOK, who in other cases paid attention to this characteristic, as is demonstrated by his description of *Stichopathes gracilis* Gray. From all this I conclude that it will be better to make a new species of SILBERFELD's specimen, and call it *Stichopathes variabilis* n. n. The diagnosis is:

COLONY: slender, partly spiral, sometimes at once diminishing in diameter, or sometimes with increasing diameter; otherwise regularly tapering.

SPINES: triangular, with their distal side at right angles with the axis, or distally inclined; smooth (?); 6—7 longitudinal rows, length max. 175 μ, sometimes different on opposite sides of the axis; mutual distance 400—425 μ (?). Sometimes forked apex.

POLYPS: in one series, which sometimes is spiral in its course; interpolypar distance 1.5 mm. Lateral tentacles equal in length. Well-developed

oral cone with round or sagittally elongated mouth, in the former case with folds in its wall.

4. *Stichopathes ceylonensis* T. & S. According to the description of this species, it differs from *Stichopathes pourtalesi* only in having less crowded polyps and a different arrangement of the spines. Since the description is very vague, I see no opportunity of taking a decision on a possible identification, and this is my only reason for keeping this species intact, but for the same reason the diagnosis can only be very vague:

COLONY: scarcely tapering; first part straight, afterwards wound in a sinistrorsal spiral.

SPINES: triangular, laterally compressed, at right angles with the axis; 4 longitudinal rows; length $^1/_3$ of the axis diameter; mutual distance 2 to 3 × the length of the spines.

POLYPS: prominent; long tentacles; interpolypar distance is half the length of a polyp.

5. *Stichopathes papillosa* T. S. This species is in the shape of the spines, their surface, the grooves between the polyps, the dimensions of the polyps, etc. very like *Eucirripathes anguina*, but the colony is wound in a dextrorsal spiral. The diameter of the coils is much less than in *Eucirripathes spiralis*, to which it is very like in the shape of the colony, but the polyps are not of the same built. Although it is not impossible that this species may appear to be an *Eucirripathes*, if more specimens can be examined, just as is the case in *Eucirripathes spiralis*, for the present we have to consider it as a *Stichopathes*, nearly related to some *Eucirripathes*-species. Diagnosis:

COLONY: dextrorsal spiral; diameter of spiralcoils 1.3 cm.; distance between the coils ± 1.4 cm.; stem gradually tapering.

SPINES: Conical, slightly, but distinctly papillose on their apex or on their entire surface; 10—14 longitudinal rows; dimensions?

POLYPS: long tentacles (or contracted to low broad cones); mouth transversally elongated; large and prominent oral cone, interpolypar distance ± 2 mm.; thick coenenchyma.

F. COOPER describes a variety with secondary spines.

6. *Stichopathes filiformis* (Gray) Brook (except SILBERFELD's specimen of this species, which specimen is made by me into the new species *Stichopathes variabilis*), to which I have joined *Stichopathes dissimilis* Roule and *Stichopathes Richardi* Roule. The diagnosis of *Stichopathes dissimilis* is as follows: the stem is long and slender, whiplike, everywhere of equal diameter, except near the top; large conical spines, 250 to 400 μ long, in 5—6 longitudinal rows. The polyps present two types (whence the specific name); one of these types is large with thick tentacles, 1.25 mm. long (the sagittal ones) and 0.8 mm. (the lateral ones), sometimes radiate, sometimes in three pairs (as in *Parantipathes*). The other type of polyp is small,

with the dimensions twice as small as in the first type; the tentacles are shorter in the same proportion. Both types alternate regularly, with an interpolypar distance of 2 to 3 mm. Sometimes the small polyps are absent and the interpolypar distance of the larger polyps is in this case 4 mm.

On closer inspection of the most typical characteristic, viz. the shape and the arrangement of the polyps, it must be remarked that: 1⁰ the alternation of the larger and smaller type of polyps is not regular, as is mentioned by Roule himself, who says that on some parts of the colony only the larger type occurs, with a somewhat greater interpolypar distance, and smooth coenenchyma between the polyps, 2⁰ a regular alternation of larger and smaller polyps occurs repeatedly in many other species (also among the Siboga-material), but very rarely on the entire colony, and also a more irregular alternation is present, e. g. two small ones, one larger one, etc., together with a regular alternation on other parts of the same colony, or a series of larger polyps only, 3⁰ the two subtypes of larger polyps, viz. one with radiate tentacles and one with the tentacles in three pairs, the latter of which types is present on the higher parts of the colony, may be explained by the available room on the axis; as long as the axis is young and slender, the polyps are forced to arrange their tentacles in pairs, while on the older and thicker parts of the axis the tentacles have more room and can be arranged in a radiate manner; the radiate tentacles indeed appertain to polyps, which once, in a younger stage of the colony-growth, were themselves inserted on the top of the colony and in their turn had their tentacles arranged in three pairs; 4⁰ the small polyps have, even on the higher parts of the colony, always a radiate arrangement of the tentacles, since there is room enough for them, where the twice larger polyps are coerced by the diminishing room to arrange their tentacles in pairs; 5⁰ the smaller polyps have the same shape and structure as the larger polyps, only on a twice smaller scale, and since there are parts of the coenenchyma, where there is no trace of the smaller polyps, it is obvious that the small type is only a young individual from the larger (adult) type; they are young polyps, alternating more or less regularly with the adult ones, as was repeatedly found by me in other species and genera; probably the coenenchymal parts without small polyps are going to have them. This interpolypar growth of the colony is often to be found together with the apical growth. As type of polyp, characteristic for *Stichopathes dissimilis* R., we should consider Roule's larger type of polyps, with a radiate arrangement of the tentacles (Roule: 14 pl. VI, fig. 3). — Concerning the spines the following remarks may be made: the very variable mode of arrangement of the spines on one and the same colony is frequently to be met with in various, very diverging species in a greater or lesser degree, without it being possible to look upon it as a typical characteristic. The arrangement, as it is figured by Roule on his pl. VI, fig. 2*a*, although embracing only the smaller part of the colony, appears to me as the normal condition, which ought to be characteristic, and from which the other arrangements may be derived. — I myself have found again and again colonies with a regular distribution of the spines, while some specimens of the same species showed an irregular distribution over a great distance through shifting of the spines, torsion of the axis, and such reasons. The normal condition of the spines in *Stichopathes dissimilis* R. is in my opinion: 5—6 longitudinal rows, alternating in a quincunx; length 250 to 400 μ; mutual distance $\pm$ 500 μ; acute conical shape, at right angles with the axis; smooth surface (?).

On comparing these characteristics with *Stichopathes Richardi* Roule, we find that the shape of the colony is the same as in *Stichopathes dissimilis* R., as is very conspicuous on Roule's Pl. I, where both species are figured next to and over each other in a very beautiful and clear manner. Roule himself describes the colonies of *Stich. Richardi* R. as short and thick, compared with the other species, but this difference is not very great, since he remarks himself that the length of the colony may be 6 dm. with a greatest diameter of 1.5—1.75 mm., while *Stich. dissimilis* is 0.55 m. long with a greatest diameter of 1.75 mm. (these data are deduced from Roule's figure 2 on his Pl. II, since he himself does not make mention of the basal diameter). Beside the fact that this difference is not worth mentioning, after this comparison *Stich. dissimilis* would be rather the shortest and thickest type, but it will be better to look upon these not very diverging measurements as variants of an average value. — The basal plate of *Stichopathes Richardi* is granulated, but in my opinion the shape of a basal plate is no characteristic quality, since I remarked in various Siboga-species that the shape of this plate is entirely dependent on the accidental underground, the irregular parts of which are followed by the basal plate, with a thin horny layer. — The spines, which are of the same shape as in *Stich. dissimilis* R., are arranged in 7—8 longitudinal rows; they are 200—300 μ long, with a mutual distance of 300—330 μ. These data are not very different from those of *Stich. dissimilis* R., especially on keeping in view the very great variability of these dimensions in other described species. — It is true that the number of longitudinal rows is much greater, but on one and the same colony Roule himself finds a much smaller number of rows, viz. 4—6, which not only demonstrates the great variability of this character, but which also shows how the extreme values of *Stich. Richardi* R. are as far above as they are below the normal number of rows in *Stich. dissimilis* R. The distribution of the spines in *Stich. Richardi* R. is more regular than in *Stich. dissimilis* R. but on the value of the greater or smaller regularity of the distribution of the spines I have given my opinion when discussing *Stich. dissimilis* R. — The polyps of *Stich. Richardi* R. are very much like those of *Stich. dissimilis*, as is demonstrated by the figures of Roule himself, especially on his Pl. I (**14**), where both colonies are figured; on both colonies the habitus of the polyps is absolutely similar. The dimensions are slightly different, but it is possible that the preservation exerts a certain influence upon the length of the tentacles and such data, for on one and the same colony of other species I often found polyps with very long and with very short tentacles (cf. *Stich. variabilis*). The opinion that the preservation is the principal reason of this different length is confirmed by the fact that the ratio between the sagittal and lateral tentacles in *Stich. dissimilis* R. is 1.25 : 0.8 = 1.56, while this same ratio in *Stich. Richardi* R. is 2.25 : 1.50 = 1.50, and so is different in the second decimal only. — The polyps of *Stich. Richardi* R. are somewhat more crowded than in *Stich. dissimilis* R.; in the former the interpolypar distance is 1.5 mm., in the latter 2 to 3 mm. according to Roule. But on verifying these data on Roule's Pl. VI and VII (**14**), where the polyps are figured enlarged, we find for *Stich. Richardi* R. an interpolypar distance of o v e r 1.5 mm. and for *Stich. dissimilis* R. n e a r e r 2 than 3 mm., so that also this difference is not very great, referring to the individual variability in other species. — The stripes or grooves between the polyps of *Stich. Richardi* R. are found by me on many colonies of other species, so that

I am inclined to look upon them as a general character of all Antipatharia, which however, under the influence of special conditions, may be entirely or almost unvisible, just like the longitudinal groove on the back of the polyps, as I repeatedly found as a cicatrice of the axis-formation. ROULE himself remarks that these cross-grooves are absent on parts of a colony, while they are present on other parts of the same colony; so it is not a useful specific character. — The alternation of the large and the small polyps is irregular in *Stich. Richardi* R., as ROULE describes and figures, without thinking, in this case, about a double type of polyps, although here it would have been also to the point, unless ROULE has not thought about it since the smaller polyps in these colonies show a distinct difference in growth; the distribution of young polyps and the adult ones should in any case be left out of consideration.

The likeness between both species seems to me large enough to permit, and even to require, a uniting of them into a species even when no further identification is permitted; I would prefer to name this species *Stichopathes Richardi* R., sooner than *dissimilis*, since the latter name supposes as characteristic a non-existing quality. — The very different type of polyp permits of no comparison with *Stichopathes gracilis* (Gray) Brook. The likeness to *Stichopathes filiformis* (Gray) Brook is very great. In BROOK's description of *Stich. filiformis* the stem is slender and filiform, everywhere of equal thickness. The spines are conical with their distal side at right angles with the axis or slightly distally inclined; there are 6—7 longitudinal rows of spines visible from one aspect in BROOK's figures, their length is 400 μ (deduced from BROOK's figures) while they are "one and a quarter to one and a half lengths apart". Although the polyps are unknown, these data are so well in accordance with those of ROULE's species *Stich. Richardi* and *dissimilis*, that these three species ought to be combined under the name of *Stichopathes filiformis* (Br.) emend. The diagnosis of *Stich. filiformis* should be emendated as follows:

COLONY: whip-like, of subequal diameter over its entire length, slender; sometimes increasing in diameter in the basal part.

SPINES: conical, at right angles with the axis, or slightly distally inclined, smooth(?); 4—8 longitudinal rows; length 200—400 μ; mutual distance 300—500 μ (400—600 μ according to BROOK).

POLYPS: interpolypar distance 1.5—3 mm.; sagitttal tentacles 1.25—2.25 mm., lateral ones 0.8—1.5 mm.; tentacles radiate, not covering the oral cone; especially the sagittal tentacles stand off from the axis; round mouth with crenated wall.

7. *Stichopathes abyssicola* Roule. ROULE is right in supposing that these specimens are not young colonies of *Stich. Richardi* R., although they are like each other, for, till now, there is no reason whatever to suppose that on younger colonies the polyps should be smaller than on older colonies. On the contrary: probably the dimensions of the polyps are always the same, while only the shape of the polyp may be somewhat altered by more or less room on the axis so that on younger colonies the polyps may be more elongated than on the older and larger colonies. — Besides in this case especially there is no reason to think about young colonies of *Stich. Richardi* R., since the smaller polyps, which then ought to have the same

proportion between the length of the tentacles, show an other proportion than *Stich. Richardi* R. While the proportion between the sagittal and the lateral tentacles in the latter species is 1.50, this value is in *Stich. abyssicola* 1 : 0.6(—0.5) = nearly 2. — The colonies are "courtes et grêles" but this is not entirely right, compared with *Stich. Richardi* R., for the length of *abyssicola* is much less (± 0.25 m.) while the diameter is 0.4—0.8 mm., so that the colony is rather thick and in any case not extremely thin. In my opinion *Stich. abyssicola* R. is not so much like *Stich. filiformis* (Gray) Brook as Roule believes it to be, as is remarked by Silberfeld already. The spines of *Stich. abyssicola* R. are almost twice as small, twice as crowded, in twice the number of longitudinal rows, and they are in a rather high degree distally inclined, while the spines of *Stich. filiformis* are at right angles with the axis or nearly so. — I would be more inclined to put *Stich. abyssicola* R. in the neighbourhood of *Stich. desbonni*, differing in not having its spines in verticils. But Pourtalès' figures do not allow to form conclusions with certainty. It is remarkable that the growing in groups, which is mentioned for *Stich. desbonni*, seems to occur also in *Stich. abyssicola* R. (cf. Roule's specimens of station 1116; **14** p. 65). The likeness remains very vague however.

Diagnosis:

Colony: short, slender, curved, some dm. long, sometimes growing in groups.

Spines: distally inclined, convex proximal side, concave distal side, acute, smooth (?); 200—250 μ. long; mutual distance 830 μ.; 4—5 longitudinal rows.

Polyps: small and delicate, not very conspicuous; long, thin tentacles, with a radiate arrangement; sagittal tentacles 1 mm., lateral ones 0.5—0.6 mm.; interpolypar distance 2.5 mm. Mouth transversally elongated.

8. *Stichopathes flagellum* Roule. According to Roule this species approaches *Stich. occidentalis* (Gray) Brook, but differs from it, by *Stich. occidentalis* having a thinner axis, a less regular arrangement of the spines with not so regular longitudinal rows as in *Stich. flagellum* R. and sometimes an inclination to have the longitudinal rows wound in a dextrorsal spiral round the axis. In my opinion the differences between both species are greater than Roule indicates, since they diverge rather much in length and in the mutual distance of the spines. While I have joined *Stich. occidentalis* to *Stich. gracilis* (Gray) Brook, I am inclined to keep *Stich. flagellum* intact as a species. — I would rather see a likeness between *Stich. filiformis* and *Stich. flagellum*, for both have the same shape of the axis, viz. slender, filiform, everywhere of equal diameter, but the dimensions of the spines are too different. The diagnosis of *Stich. flagellum* R. is:

Colony: very slender, whiplike, everywhere of equal diameter, curved; 5—6 dm. long with a basal diameter of 1.2—1.3 mm.

Spines: small, conical, in 4—5 longitudinal rows, alternating in a quincunx; length: 130 μ. (according to Roule's pl. VI, fig. 4*c*, this length occurs, while Roule gives 50—60 μ. as an average)[1]); mutual distance 230 μ.

1) Usually in the diagnosis I give the greatest length of the spines on the colony since otherwise the average length of the spines might be entirely different for a fragment of a colony or for a complete colony.

Polyps: very delicate, not very conspicuous; thin tentacles; sagittal ones 1 mm., lateral ones 0.5 mm. Interpolypar distance 3.5—4 mm. Mouth transversally elongated; no visible oral cone. Tentacles not covering the mouth. Proximal lateral tentacles predominate.

Without any doubt there is a great likeness between *Stichopathes flagellum* R. and *Stich. abyssicola* R., especially if one sees Roule's pl. I (14), where both species are figured. The polyps (Roule's pl. VIII figs. 1, 4, 4*b*) are also very like each other, e. g. in their dimensions. But the interpolypar distance is very unequal, although perhaps the greater distance in *Stich. flagellum* R. may be explained by the young polyps being invisible between the adult ones; the entire covering of the colony is in a very contracted state. But since there are also differences in the spines, it is perhaps better to keep for the present both species apart, although they are certainly nearly related to each other. It is surely remarkable that the colonies of *Stich. flagellum* are found without exception in depths (1494 M., 1425 M., 2165 M., 1300 M., 1500 M.) which have given *Stich. abyssicola* its specific name.

9. *Stichopathes spinosa* Silberfeld. This species is only kept intact since figures of polyps and spines are entirely lacking, which could be in part be compensated by a very detailed description. But on the contrary Silberfeld's description of this species is rather scanty. His diagnosis: "gekrümmte *Stichopathes* mit starken, etwa 280 μ hohen Dornen an einer Achse von über 1 mm. Durchmesser" is, given the abundance of new created species, of a very doubtful value and can scarcely be called characteristic. But the description, which follows this diagnosis, is also vague and defective. The following diagnosis however might be deduced from it:

Colony: whiplike, curved; regularly tapering.

Spines: blunt or acute triangular; distal side at right angles with the axis; length 278 μ; mutual distance ± 550 μ; 6—7 longitudinal rows.

Polyps: long tentacles, sometimes lying around the oral cone; interpolypar distance 1—1.25 mm.

Since further data are not available I dare not propose a nearer identification, although various characteristics make me think of *Stichopathes variabilis*, especially on keeping in view the possibilities of the variability in the extensive Siboga-material of the latter species.

10. *Stichopathes* (?) *maldivensis* Cooper. From Cooper's description, which is rather incomplete, can not be concluded with certainty that there is only one single series of polyps, since it is not sufficient for a *Stichopathes* to have its polyps only on one side of the axis. In *Eucirripathes* the polyps are very often confined to one side of the axis, especially if the colony is wound in a spiral. — The small spines, distributed irregularly between the larger spines appear to me as having no great importance, since I found such rough points also on colonies, which lacked them on other parts. — If we keep this species intact, it will be only through the defective description. — Diagnosis:

Colony: 85 cm. long with a basal diameter of 4 mm.; regularly tapering; jetblack.

Spines: large, blunt, conical, granulated surface with small protuberances on the apex; according to fig. ± 7 irregular longitudinal rows, and according to description: irregular spirals. — Very small spines distributed irregularly between the larger ones.

Polyps: white. Digitiform tentacles. On one side of the axis.

11. *Stichopathes longispina* F. Cooper.

The description is not very detailed, so that only a rather vague diagnosis can be given, and no identification can be tried.

Colony: straight, whiplike, tapering; basal diameter 1 mm. with a length of 92 cm.

Spines: longest ones: 400—500 μ, shortest ones: 140—170 μ; smooth (?), arranged in 7 longitudinal rows; long spines nearly at right angles with the axis; short spines distally inclined. Acute. Mutual distance 550 μ.

Polyps: flat with long digitiform tentacles; crowded; diameter 0.75 mm.

12. *Stichopathes alcocki* F. Cooper. This species is nearly related to *Eucirripathes spiralis*; cf. my fig. 216 with Cooper's enlarged spine in his fig. 3 (20). — However the very wide axial canal, so that the corallum-wall is reduced to a thin shell, is never present in *Eucirr. spir.* — Also the small spines between the larger ones are not found in the latter species. — In other points Cooper's species is so very like *Eucirr. spir.* that perhaps *Stich. alcocki* ought to be regarded as a variety of the *Eucirripathes* in question. — For the present we will keep this *Stichopathes* intact with the following diagnosis:

Colony: a close spiral: the central canal of the axis is so very large, as to reduce the wall of the corallum to a thin shell.

Spines: 10 longitudinal rows; short (200 μ), sharp and hooked upwards, or longer (300 μ) and bluntly conical, at right angles with the axis; both roughened. Secondary spines: sharp, triangular, irregularly scattered.

Polyps: largest ones 1 mm. in diameter; very flat; tentacles long, digitiform; prominent oral cone.

13. *Stichopathes seychellensis* F. Cooper. Diagnosis:

Colony: straight; tapering gradually; basal diameter 1 mm. with a colony-length of 45 cm.

Spines: 5 longitudinal rows: length 200 μ and 100 μ on opposite sides of the axis; at right angles with the axis, or distally inclined; concave sides; triangular; smooth (?).

Polyps: round, prominent; circular mouth on a domeshaped oral cone; tentacles conical; sagittal tentacles inserted at a lower level; length of tentacles 1 mm. (?); interpolypar distance 1.3 mm. (?).

14. *Stichopathes ? bournei* F. Cooper. The polyps are unknown, so that a possible identification with other species is not well feasible. The diagnosis can only be given in the following cursory manner:

Colony: straight, tapering; basal diameter 6 mm. with a length of more than 1 m.

Spines: 5 longitudinal rows; one side of the axis is smooth, the other side has spines of 200 μ; blunt, conical, distally inclined, with a much papillated surface. — Sometimes secondary spines on the smooth side of the axis.

Polyps: unknown.

The **Siboga-specimens** contain the following species:

1. *Stichopathes solorensis* sp. n.

Stat. 305. Solor-strait. 113 M. Stony bottom. 1 spec.

This colony, lacking the natural base, is 17 cm. high; beginning with the base itself it is wound in a sinistrorsal not absolutely regular spiral, wherefrom $4^1/_2$ coils are visible, the diameter of which diminishes regularly towards the top of the colony from 3.5 to 2.5 cm.; there is a distance of 4 cm. between the coils. — The basal diameter of the axis of more than 1.5 mm. diminishes regularly towards the slender top. The spines (fig. 105) are triangular, with a distally inclined, blunt apex and a concave distal side; the proximal side is concave at the base, convex at the top. On the younger part of the colony the apex is more acute (fig. 105, *c*). The surface is smooth; the length of the spines (100 to 140 μ) is subequal on every side of the axis; there are 6 to 7 longitudinal rows, alternating in a quincunx, which disappears sometimes through the variable distance of the spines, which is 375 to 450 μ. The spines perforate the coenenchyma (fig. 106) but not the polyps. The lightbrown polyps (fig. 106) are arranged in a single series, with an interpolypar distance of more than 2 mm., and there are many young polyps between the adult ones, however without alternating regularly with them; a part of the colony has i. a. the following alternation (*a* = adult, *y* = young): *y – a – y – a – y – a – y – a – y – y – a – a – a – y – a – y – y – y – a – y – a – a – a – a – y – a – a – a –* etc. Together with rows of adult ones or rows of young ones, also a regular and an irregular alternation occurs. — The sagittal tentacles are inserted at a lower level than the lateral ones, which are lying against the oral cone. The sagittal tentacles are 1 mm. long; the lateral ones are of the same length or somewhat less, but they are thinner. The oral cone is well developed with a round mouth, but both are usually not visible since they are covered by the lateral tentacles. There is not much difference between this species and *Eucirripathes spiralis* (Blainv.), of which it might be a variety with an other type of spines. Both species are nearly related. The diagnosis is as follows:

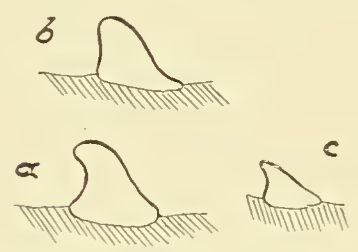

Fig. 105. *Stichopathes solorensis* sp. n. Three types of spines; *a*, *b*, *c* 52 ×.

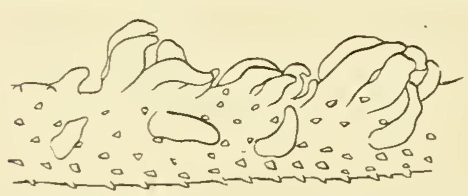
Fig. 106. *Stichopathes solorensis* sp. n. Polyps; 7.6 ×.

COLONY: a spiral, with coils of increasing diameter towards the top. Coil-diameter 2.5 to 3.5 cm. Regularly tapering.

SPINES: triangular, blunt apex, concave distal side, convex and concave proximal side, smooth. Length 100 to 140 μ; mutual distance 375 to 450 μ; 6 to 7 longitudinal rows alternating in a quincunx.

POLYPS: Sagittal tentacles 1 mm. long, lateral ones as long but thinner; sagittal tentacles at a lower level. Oral cone well developed; round mouth. Interpolypar distance more than 2 mm. All the tentacles distally inclined.

2. *Stichopathes gracilis* (Gray) emend.

Stichopathes gracilis (Gray). BROOK, Antipatharia. Chall. Rep., p. 90, Pl. XII, figs. 17—19.
Antipathes (Cirrhipathes) gracilis Gray. GRAY, Proc. Zool. Soc. London, 1857, p. 291.
Antipathes (Cirrhipathes) setacea Gray. GRAY, Ann. and Mag. Nat. Hist., ser. 3, vol. VI, p. 311.
Stichopathes pourtalesi Br. BROOK, Antipatharia. Chall. Rep., p. 89, cf. synon. at BROOK.
Stichopathes gracilis Gray var. *spiralis* T. & S. THOMSON and SIMPSON, On the Antipatharia.
Stichopathes gracilis Gray var. *α* Sch. SCHULTZE, Die Antipatharien der deutschen Tiefsee-Exp. p. 93, 94, Taf. XIII, figs. 2, 4; Taf. XIV, fig. 15.
Stichopathes? occidentalis (Gray) Brook. BROOK, Antipatharia. Chall. Rep., p. 92, pl. XII, figs. 7, 8; cf. synon. at BROOK.
Stichopathes echinulata Brook. BROOK, Antipatharia. Chall. Rep., p. 92, pl. XII, fig. 9.
Stichopathes indica Sch. SCHULTZE, Die Antip. der deutschen Tiefsee-Exp. p. 96, Taf. XIII, figs. 6, 8.
Stichopathes setacea Gray. J. Y. JOHNSON. The Antipatharian corals of Madeira. Proc. Zool. Soc. London. Pt. IV, p. 57.

Stat. 310. 8° 30′ S., 119° 7′.5 E. Flores-sea. 73 M. Sand with few pieces of dead coral. 2 spec.

One of the specimens is 70 cm. long and lacks the natural base; the entire colony is wound in a sinistrorsal spiral, wherefrom three coils are visible, with a diameter of 15 cm. and a mutual distance of 7 cm. between the coils. The height of the colony is 30 cm.; the basal diameter is 3.75 mm. and diminishes regularly towards the rather slender top, which on 5 cm. distance from the apex has a diameter of 1 mm. The spines are triangular or cylindrical and blunt; they are distally inclined. Their length is somewhat greater at the polyp-bearing side of the axis, viz. 150 μ, but interspersed between the larger ones many smaller spines occur. Their mutual distance is rather variable, as is shown in fig. 107, where they perforate the coenenchyma; the average distance is 530 μ. Usually the spines are irregularly distributed, in a large number, but sometimes there are traces of longitudinal rows, ± 10 at a rough estimate, which are rather vague. The irregularities are mainly caused by doubling of the spines; both members of a pair are removed at a more or less great distance from one another. This doubling of the spines occurs on a short distance (15 cm.) from the top, although the distribution is more regular here. In this part there are 6 longitudinal rows, which

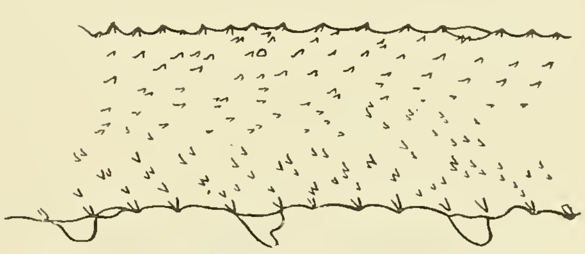

Fig. 107. *Stichopathes gracilis* (Gray) em. Spines; 7.6 ×.

may alternate in a quincunx, but a more irregular distribution and doubling of the spines is sometimes also present. In this top-part the spines are more distally inclined and more acute than in the basal part of the colony; the surface of the spines is slightly granulated. The double spines have a mutual base which is darker in colour and somewhat swollen.

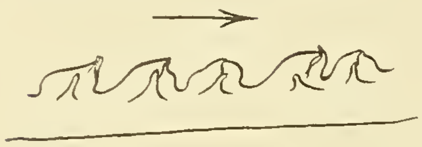

Fig. 108. *Stichopathes gracilis* (Gray) em. Polyps; 3 ×.

The polyps (figs. 108, 109) are arranged in a single series, at an intertentacular distance of 2.5—3 mm. They are very crowded and only on the lower parts of the colony there is 0.5—1 mm. coenenchyma visible between the base of the tentacles of neighbouring polyps. Some young polyps are inserted between the adult ones but not alternating regularly. — The sagittal tentacles are inserted at a lower level than the lateral ones. The sagittal tentacles are more than 1 mm. long; the proximal lateral ones 2 mm., the distal lateral ones 1 mm. The proximal pair is much more heavily built than the distal pair and also inclined distally in a higher degree than the distal pair which is nearly at right angles with the axis. In this manner the tops of the lateral tentacles are lying against each other, so as to cover the mouth and oral cone entirely. The proximal pair clearly shows cross-folds. The base of the tentacles is swollen, and there is a rather sharply defined cylindrical apex.

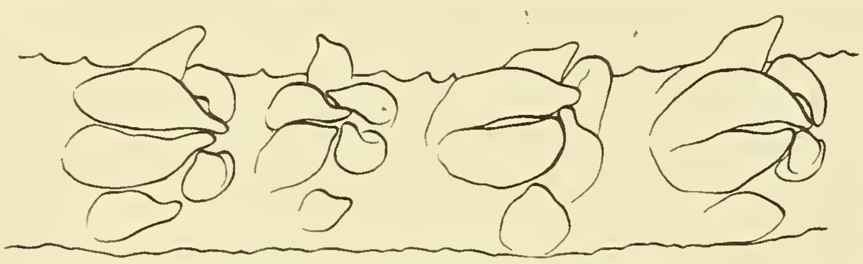

Fig. 109. *Stichopathes gracilis* (Gray) em. Polyps; 7.6 ×.

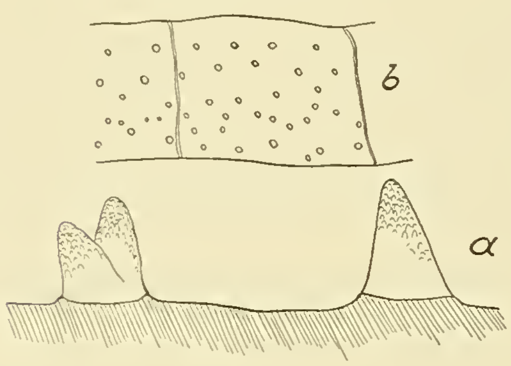

Fig. 110. *Stichopathes gracilis* (Gray) em. *a* Spines on the base of the colony; *b* arrangement of the spines on the base of the colony; *a* 52 ×; *b* 7.6 ×.

The other specimen, broken in three parts, is 1.15 m. long and is curved in irregular curves and half-spiralcoils, especially in the upper part. The base is 5 mm. thick, with a slightly broader basal plate. The axis gradually tapers towards the top which is broken at a diameter of 1.75 mm. At various heights curves occur at obtuse angles and also knobs.

The spines (figs. 110, 111) are conical with an elliptical base and an obtuse apex, at right angles with the axis or slightly distally inclined. Doubling of the spines occurs in various degrees; the top of the spines is granulated, the base is smooth. The shorter spines are more granulated; they are more blunt and inclined distally to a higher degree. The longest spines (230 μ) are to be found on the polypbearing side of the axis; the shortest spines on the opposite side are 130 μ long. The mutual distance varies and is max. 420 to 500 μ. At the base of the colony the spines are much shorter; occasionally a longer spine may be found between them but here the longest are only 75 μ, while the shorter spines have nearly disappeared. — The distribution of the spines is nowhere regular; some parts show for a short space some longitudinal rows (± 6). A great part of the colony is covered with polyps (fig. 112), inserted in a single series at an interten-

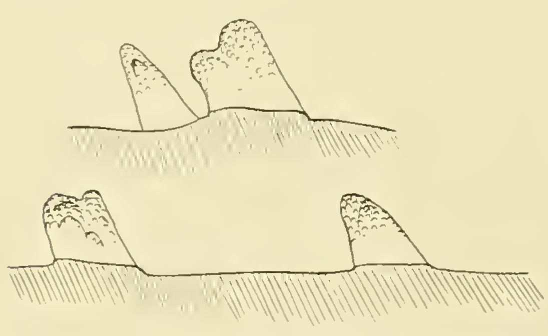

Fig. 111. *Stichopathes gracilis* (Gray) em. Spines on the top of the colony; 52 ×.

tacular distance of 2.5 mm. Young polyps are distributed in an irregular manner between the adult ones. The sagittal tentacles are inserted at a slightly lower level than the lateral ones; the proximal pair of the latter tentacles is more heavily built than the distal pair but not to such a degree as with the first specimen. The distal pair is not at right angles with the axis, but curved just like the proximal pair, and all the tentacles are somewhat crosswrinkled. The sagittal tentacles are 1.1 mm. long, the proximal lateral ones 1.5 mm., the distal lateral ones more than 1.1 mm. The oral cone is well developed with a round mouth, the walls of which are somewhat crenated. The diameter of the oral cone is 0.5 mm. The cross-groove between the polyps is clearly visible. Both specimens principally differ in the shape of the colony, the length of the spines, the inclination of the spines, the dimensions of the polyps and the more or less predominating of the proximal lateral tentacles.

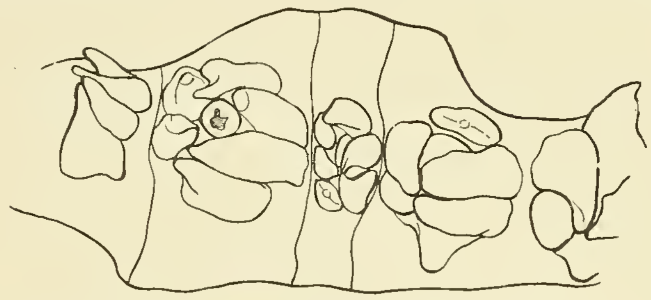

Fig. 112. *Stichopathes gracilis* (Gray) em. Polyps loosened from the axis; 7.6 ×.

The first specimen differs from Brook's *Stichopathes gracilis* (Gray) in the spiral stem, while the less regular distribution and the inclination of the spines would at an earlier date have justified the making of a new species, which now is not well possible. The likeness with Schultze's var. α is very great, especially as far as the polyps are concerned, which show a very conspicuous difference between the proximal and the distal pair of lateral tentacles; which, besides, have a swollen base of the tentacles with a more cylindrical toppart; which have a high oral cone with (in this case) a round mouth. The dimensions and the interpolypar distance also agree very well with Schultze's data, and the same holds good for the dimensions and the shape of the spines although the distal side is not at right angles with the axis. The length of the spines is somewhat less; the distribution is not so regular. — Young and adult polyps do not alternate so regularly; rugae are absent or not visible in the Siboga-specimens and present in Schultze's specimen. — In my opinion all these differences are of no specific value.

The difference between this specimen and *Stichopathes gracilis* Gray var. *spiralis* T. & S. lies in the distribution and the shape of the spines. — It differs from *Stichopathes echinulata* Brook in the spiral stem, the irregular distribution of the spines and the more crowded polyps. The differences between this specimen and *Stichopathes flagellum* Roule are much greater in my opinion.

The second specimen differs from Schultze's var. α in the granulated spines, distributed in a more irregular manner, while the colony is not wound in a spiral. — They agree in length of the spines, in the different length of the spines on opposite sides of the axis, in the mutual distance of the spines, etc. — It differs from Brook's *Stichopathes gracilis* (Gray) in having a nearly straight stem and a more irregular distribution of the spines, not always at right angles with the axis. Besides the doubled spines have no swollen base; but the doubling itself and further characteristics of the spines agree with Brook's description. The many differences between both specimens, as well as the differences between the discussed species and one of the Siboga-specimens, while these differences are absent in the other specimen, confirm

my opinion about the very great variability of the species under discussion and the grouping together which results from this. — Diagnosis: cf. the diagnosis of *Stichopathes gracilis* (Gray) in the critical review of *Stichopathes*-species on p. 105.

3. *Stichopathes variabilis* n. n.

Stichopathes filiformis (Gray) Br. SILBERFELD, Jap. Antipatharien, p. 15; non of other authors.

var. *asperispina* var. n.

Stat. 7. 7° 55'.5 S., 114° 26' E. Near Batjulmati (Java). 15 M. and more. Coral and stones. 5 spec.
Stat. 53. Bay of Nangamessi (Sumba). Up to 36 M. Coral sand. 4 spec.
Stat. 77. 3° 27' S., 117° 36' E. Borneo-bank. 59 M. Fine coralsand. 4 spec.
Stat. 173. 3° 27'.0 S., 131° 0'.5 E. Ceram-sea. 567 M. Fine, yellow grey mud. 1 spec.
Stat. 204. 4° 20' S., 122° 58' E. Between islands of Wowoni and Buton. 75—94 M. Sand with dead shells. 1 spec.
Stat. 213. Anchorage off Saleyer. Up to 36 M. Mud and mud with sand. 66 spec.
Stat. 260. 5° 36'.5 S., 132° 55'.2 E. Near Kei-islands. 90 M. Sand, coral and shells. 1 spec.

var. *lissispina* var. n.

Stat. 47. Bay of Bima. 55 M. Mud with patches of fine coral sand. 1 spec.
Stat. 240. Banda. From 9—45 M. Black sand, coral, Lithothamnion. 41 spec.

var. *longispina* var. n.

Stat. 50. Bay of Badjo, Flores. Up to 40 M. Mud, sand and shells. 1 spec.
Stat. 51. Molo-strait. 69—91 M. Fine grey sand, coarse sand with shells and stones. 1 spec.
Stat. 184. South coast of Manipa-island. 36 M. Coral, sand. 1 spec.
Stat. 313. Saleh-bay, East of Dangar Besar. Up to 36 M. Sand, coral and mud. 2 spec.
Stat. 318. 6° 36'.5 S., 114° 55'.5 E. 88 M. Fine, yellowish grey mud. 3 spec.

var. *longispina* var. n., subvar. *lissispina* sv. n.

Stat. 33. Labuan Tring (Lombok). 22 M. and less. Mud, coral and coralsand. 1 spec.
Stat. 50. Bay of Badjo, Flores. Up to 40 M. Mud, sand and shells. 1 spec.
Stat. 64. Tanah Djampeah, Kambaragi-bay. Up to 32 M. Coral and coralsand. 1 spec.

var. *lissispina minor* var. n.

Stat. 64. Tanah Djampeah, Kambaragi-bay. Up to 32 M. Coral and coralsand. 14 spec.
Stat. 117. 1° 0'.5 S., 122° 56' E. Entrance of Kwandang-bay, Celebes. 80 M. Sand and coral. 50 spec.

The following specimens were divided by me in numerous species, in the preliminary sifting of the material, nearly as numerous as there were stations on which they were found. For the description I have examined each colony accurately, since soon it was obvious that there was a very great variability, so great in fact that it was desirable to unite the species, which were separated at first. Since my opinion on the great variability, i. a. of the characteristics of the spines and the shape of the colony, and therefore the combining of various, formerly described species in this genus as well as in other genera, is principally based on the data

given for these colonies, I will give their description in extenso, at least each station apart. If one would be inclined to make a number of species of them, the material is arranged and only the names are lacking. But neither the zoogeography, nor the anatomy, nor the macroscopical habitus give reason enough to separate *Stichopathes variabilis* into a number of new species. For every station I shall give the principal type, adding to this the most remarkable deviations.

var. *asperispina* var. n.

Stat. 213. Saleyer. Reef. 56 spec.

I begin with the colonies of this station, since through their great number we probably have the extreme values of the variability here, while they may not all of them be represented in smaller groups. The greater part of the 56 specimens from this station are complete colonies, but fragments of colonies are also present. Various specimens are covered with polyps.

The stem is max. 46 cm. long, with a slender top. In 20 cases the stem is wound in a slender spiral, which is very steep and the coils of which are at the utmost 3—4, often only 1 or a fraction, in number. The spiral is always sinistrorsal; the diameter of a coil is 3—8 cm., the distance between two coils: 4—10 cm. In 18 specimens the colony is partly wound in a spiral, but in 24 specimens the colony is irregularly curved and sinuous, without ever showing a spiral or even a part of a spiral.

The basal diameter cannot be given, since the colonies for the most part lack their natural base; since the diameter of the colony perceptibly increases, a too great value is found for the basal diameter, if one believes the broken base to be the natural base. In 39 specimens the diameter increases very much, to a height of some cm. above the base. Since in broken specimens the rupture may have occurred above or in the thickest part, and in this manner these fragments show no increase of diameter, we can expect as a rule that the diameter increases to a height of some cm. above the base. The diameter of the basal end is as follows for the colonies which are longer than 40 cm. (the first number gives the length of the colony, the second number the diameter at the broken base): 45 cm., 530 μ; 40 cm., 800 μ; 46 cm., 400 μ; 44 cm., 320 μ; while their greatest diameter is respectively 640 μ, 870 μ, 475 μ, 360 μ. These data appertain to the relatively low numbers, for in a colony of 15.5 cm. long the diameter of 490 μ increases to 1300 μ! — There are also colonies, which on some places show a swiftly diminishing diameter, with a jump of a few hundred μ in a very short distance, often accompanied by the appearance of an other type of spines. One colony shows regular spindleshaped thickenings of the axis (fig. 113), the length of which of 1.3 mm. is possibly in connection with the polyps. Sometimes the axis changes in its direction at an obtuse angle.

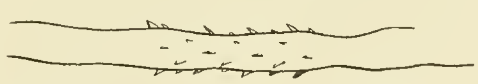

Fig. 113. *Stichopathes variabilis* n. n. Part of a colony with spindleshaped swellings; 7.6 ×.

There are 7—8 longitudinal rows of spines, but there are colonies which have only 6 rows, or even 5. Some of the latter colonies have 5 longitudinal rows on one part of the colony and 6 or 7 rows on an other part, but there are also colonies with 5 rows everywhere. The same holds good for the higher number of rows, but there are no colonies with a greater

number than 9. As a rule the longitudinal rows alternate in a quincunx (figs. 114*a*, 115*b*). This quincunx may be shifted in some parts of a colony into verticils, and may also be shifted and become slanting in different manners. Sometimes the distribution is locally entirely irregular.

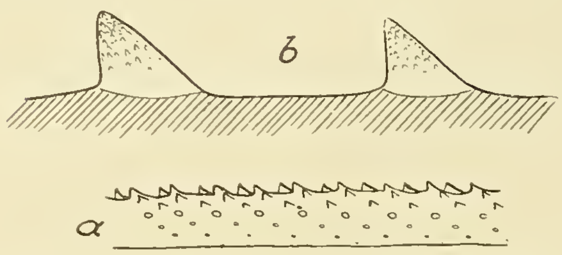

Fig. 114. *Stichopathes variabilis* n. n. *a* Arrangement of the spines; *b* spines; *a* 7.6 ×; *b* 52 ×.

In most colonies the length of the spines is different on opposite sides of the axis, but sometimes it is subequal on every side. So this unequal length on opposite sides of the axis is to be met with not only on the spiral colonies, where, as is also the case in other species, the spines are longer on the outside of the spiralcoils than on their inside, but also on the non-spiral colonies. The longest spines are from 75 μ to 525 μ and the shortest spines from 45 μ to 200 μ. The longest spines are found on the polyp-bearing side of the axis.

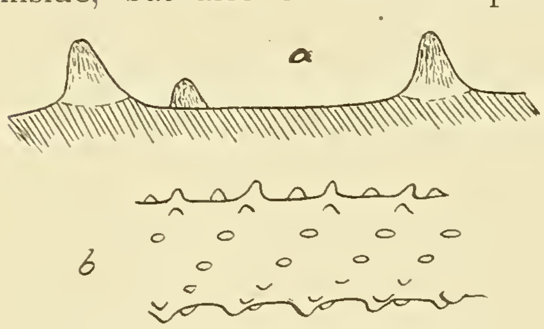

Fig. 115. *Stichopathes variabilis* n. n. *a* Spines; *b* arrangement of the spines; *a* 52 ×; *b* 14 ×.

The distance between the spines is from 375 μ to 900 μ, but is, as also holds good for the spine-characteristics described above, rather constant on one and the same colony and here varies not more than over 75 μ; on one and the same part of a colony the mutual distance is almost constant, as is demonstrated by the rather regular quincunx, which otherwise would very soon disappear. The spines on the basal part of the colony are not always the longest ones, so that the growth of the spines is at first quicker than the growth of the axis, but afterwards slower. — The shape of the spines varies in a very typical manner. We can take the type of fig. 116*a* as the most common one: rather blunt, laterally compressed, distally inclined, convex proximal side, concave distal side (at the base of the spine); granulated apex, smooth base; the granulated surface extends on the proximal side farther towards the base of the spine than on the distal side; the shorter spines are often more acute and straighter. — The numerous deviations from this type, often on one and the same colony, may consist in a distal side, which is convex in its upper part and concave in its lower part (fig. 117), or in the entire spine being triangular with its distal side at right angles with the axis (fig. 114*b*), or in the latter type having a blunt apex (fig. 118*a*). The shape may also be an equilateral triangle (fig. 118*b*); the strongest and greatest deviation is shown by the spines of fig. 119, which are very long, without increasing their basal length to the same degree; the mutual distance is often greater than the average value (the greatest mutual distance of 900 μ is observed with this type of spine!), but there are also colonies with these very long spines and with the average mutual distance or even less. While these long

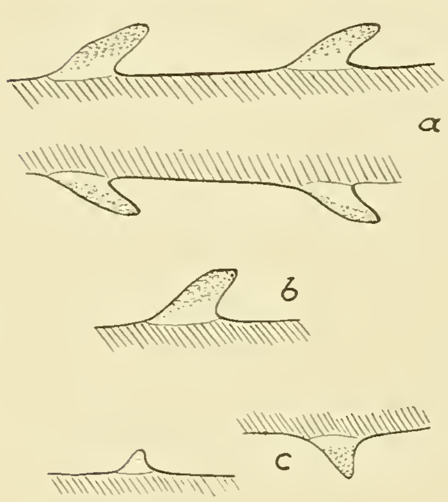

Fig. 116. *Stichopathes variabilis* n. n. *a* Spines on the base of a colony; *b* spine on a higher part; *c* spines on a still higher part; *a*, *b*, *c* 52 ×.

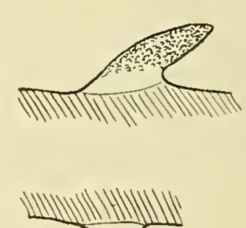

Fig. 117. *Stichopathes variabilis* n. n. Spines; 52 ×.

spines are usually distally inclined, especially as to the top which may become at last parallel or subparallel with the axis (fig. 120), they may also be straight (fig. 120, smaller spines).

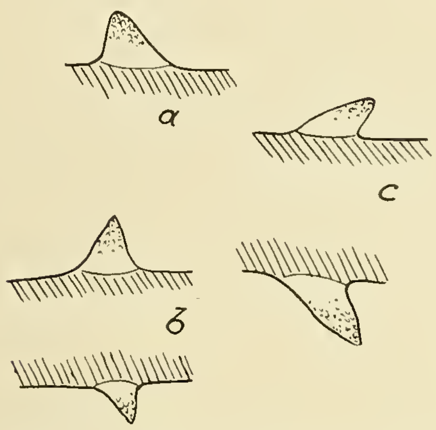

Fig. 118. *Stichopathes variabilis* n. n. Spines: *a* on the top of a colony; *b* on the thickest part; *c* on the base; *a*, *b*, *c* 52 ×.

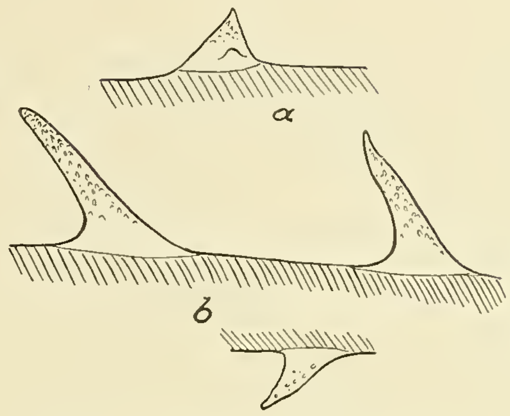

Fig. 119. *Stichopathes variabilis* n. n. *a* Spine with a begin of doubling; *b* spines on the base of a colony; *a*, *b* 52 ×.

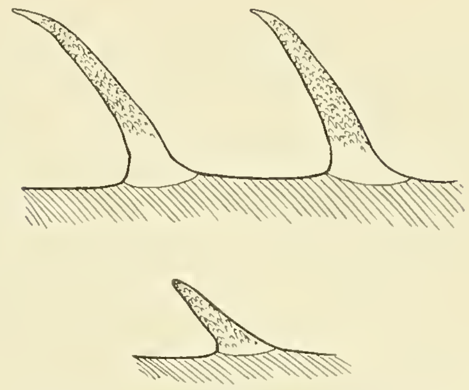

Fig. 120. *Stichopathes variabilis* n. n. Spines on the base of a colony; 52 ×.

Sometimes the surface of the spines is entirely smooth (figs. 121*c*, 122*a*, 123) while on other parts of the same colonies the surface may be granulated in a normal manner or in a very slight degree, as the same figures demonstrate. These deviations are only the more important ones, but the slighter differences are almost as numerous as the colonies themselves. On one and the same colony the shape of the spines may be very different; especially the very long spines of fig. 119 appear as a rule in the lower part of the colony, while in the higher parts

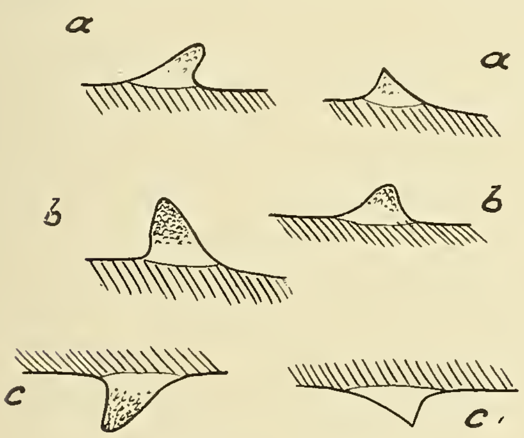

Fig. 121. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on the thickest part; *c* on the top; *a*, *b*, *c* 52 ×.

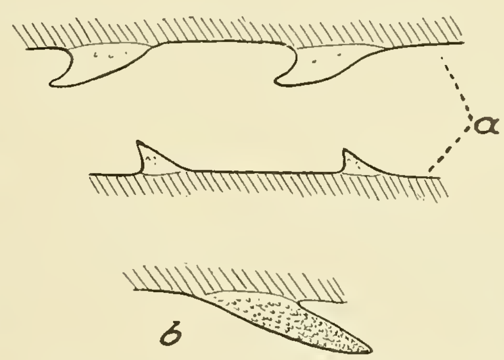

Fig. 122. *Stichopathes variabilis* n. n. Spines: *a* on the middle of a colony; *b* on the base; *a*, *b* 52 ×.

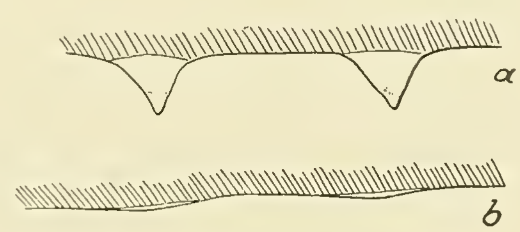

Fig. 123. *Stichopathes variabilis* n. n. Spines; *a* on the thickest part of a colony; *b* on the top; *a*, *b* 52 ×.

of the same colony often the normal type of spines occur, connected by transitive forms with the very long spines. In all there are only nine colonies which have this type of long spines. On parts of a colony a number of long spines may appear between relatively short spines and in the same manner short ones may occur between longer spines. — Some parts of the colonies are almost smooth through the disappearence of the smaller spines (fig. 123*b*). — Abnormal types of spines repeatedly occur, but as they are of no importance for the specific character, I shall leave them for the greater part alone in this description; one of the colonies has spines which are curved towards the base of the colony, while also a doubling of the spines may occur, but not in the usual manner next to each other but behind each other in the same longitudinal

row (fig. 125, 126*c*); sometimes the spines of the same pair are curved in opposite directions

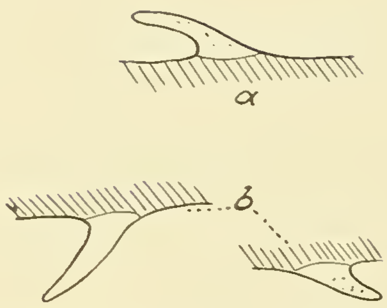

Fig. 124. *Stichopathes variabilis* n. n. Spines: *a* on the middle of a colony; *b* on the base of the same colony; *a*, *b* 52 ×.

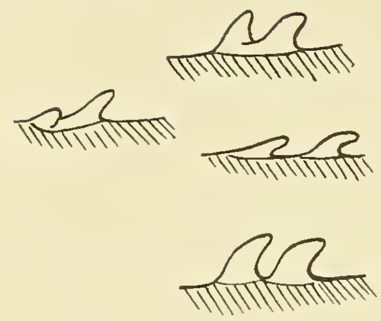

Fig. 125. *Stichopathes variabilis* n. n. Doubled spines; 52 ×.

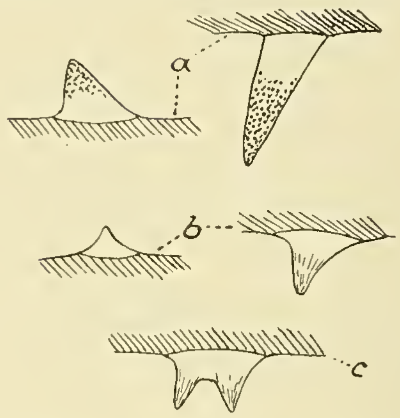

Fig. 126. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on a higher part; *c* doubled; *a*, *b*, *c* 52 ×.

(fig. 127). On the top of various colonies the young spines are furnished with two or three tops (fig. 128); the young spines are usually entirely smooth. All described deviations of the normal type of spines are linked together by transitions.

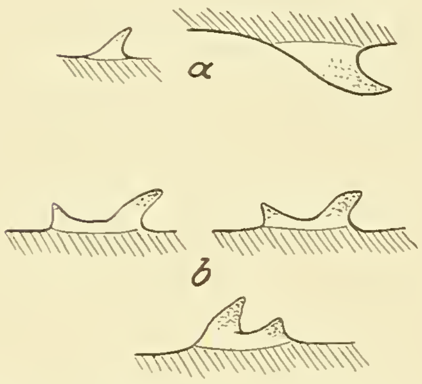

Fig. 127. *Stichopathes variabilis* n. n. *a* normal spines; *b* doubled spines on the same colony; *a*, *b* 52 ×.

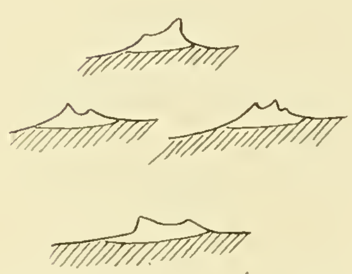

Fig. 128. *Stichopathes variabilis* n. n. Abnormal spines on the top of a colony; 52 ×.

The polyps are placed in a single series, but this series may be sinuous, however without being anywhere broken off, so that there is no question about parallel parts of a number of spirals (fig. 129). Although there is no great choice between a sinuous arrangement and a number of spiral rows, there is in this case no reason to think about an arrangement as is typical for the subgenus *Eucirripathes*. On one colony the row of polyps is sometimes wound once or more than once round the axis over a short distance. — The very diverging shape of the polyps is the best proof how cautious one should be in making use of the polypar structure and dimensions as specific or even generic differences. Very widely distributed is the

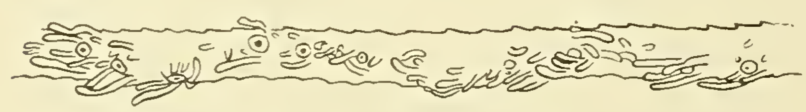

Fig. 129. *Stichopathes variabilis* n. n. Polyps; 7.6 ×.

Fig. 130. *Stichopathes variabilis* n. n. Polyps; 7.6 ×.

type of polyp of fig. 130. The polyps are yellowish and they do not rise very high above the axis; the tentacles are usually inclined distally, sometimes lying against each other (fig. 131 *b* and *c*). The sagittal tentacles are inserted at a slightly lower level than the lateral ones. There

is no great difference, or none at all, in length between the proximal and the distal pair of lateral tentacles, but all the lateral ones are shorter than the sagittal ones. The tentacles are

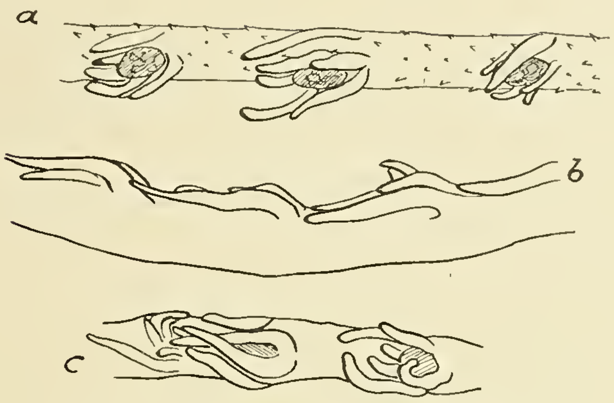

Fig. 131. *Stichopathes variabilis* n. n.
Polyps: *a* on the middle part of a colony; *b*, *c* on the top-part; *a*, *b*, *c* 11.3 ×.

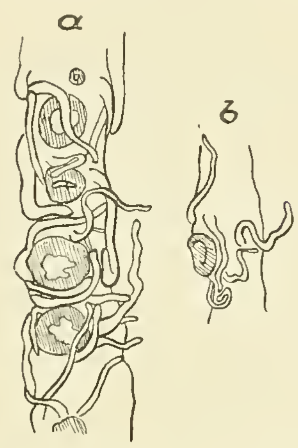

Fig. 132. *Stichopathes variabilis* n. n.
Polyps: *a* oral view; *b* lateral view; *a*, *b* 7.6 ×.

cylindrical in shape and have no swollen base, but rather a basal constriction. The oral cone is large but not very high (fig. 132 *b*); the mouth is round, and often indistinct, while the

Fig. 133. *Stichopathes variabilis* n. n.
The back of the axis with interzooidal grooves; 11.3 ×.

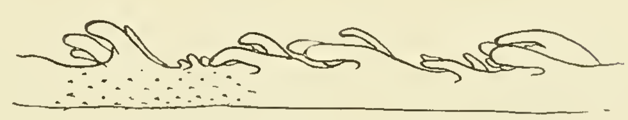

Fig. 134. *Stichopathes variabilis* n. n.
Polyps; 7.6 ×; the spines are figured partly.

margin of the mouth is folded. — Between the polyps the cross-groove is plainly visible, especially on the back of the axis (fig. 133). Young polyps are distributed irregularly between the adult ones (figs. 134, 135). — The intertentacular distance is rather variable, from 0.9 mm. to 2.5 mm. (the latter value in fig. 136) and is rather constant on one and the same colony; mostly

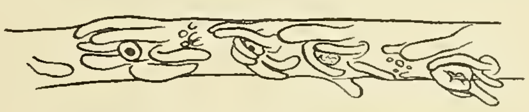

Fig. 135. *Stichopathes variabilis* n. n.
Polyps; 7.6 ×.

Fig. 136. *Stichopathes variabilis* n. n.
Polyps; 11.3 ×.

an average mutual distance of 1.3 mm. is found. — The length of the tentacles is very variable, probably influenced by the preservation; the length of the sagittal tentacles is from 0.6 mm. to 2.8 mm.; an instance of very short tentacles is given in fig. 137, of very long tentacles in figs. 132 and 138. In accordance with this the lateral tentacles vary to the same high degree,

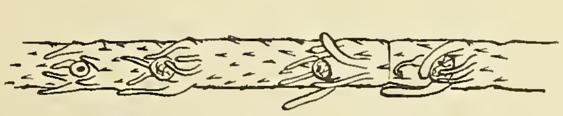

Fig. 137. *Stichopathes variabilis* n. n.
Polyps; 8.6 ×.

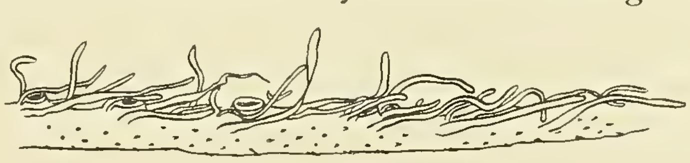

Fig. 138. *Stichopathes variabilis* n. n.
Polyps; 7.6 ×.

from 0.4 mm. to 1.3 mm. When the tentacles are short, they are often at their thickest, and when they are long, at their thinnest, so that it is possible to explain this difference in

length by the influence of preservation and different contraction, but sometimes the shortest tentacles are at the same time the thinnest ones (fig. 137). On one and the same colony the tentacles may be very different in length. — The deviations of this average type of polyps are the following: the cross-groove between the polyps may be very indistinct or entirely invisible (fig. 137, 138). While the coenenchyma and the parts of the polyps are usually thick and not transparent, so that only the tops of the spines are visible (fig. 139), they may also be so very transparent as to make it difficult to discern the parts of the polyps; in the latter case the spines are much better visible. Sometimes the polyps are so thin, especially the transparent parts, that the spines lift them very high, as is to be remarked in fig. 140, where a spine is projected very far from the oral cone, after the manner of BROOK's genus *Aphanipathes*. — Usually the tentacles are arranged in a radiate manner, but on the thinner parts of the colony the tentacles are arranged in two parallel rows (fig. 139, the left polyp). Some colonies have a great part of the stem (the basal part) covered with coenenchyma without polyps, but there are no facts to be observed, which throw light upon this degeneration of the polyps. — The oral cone of the polyps on some colonies shows 12 opaque, white, longitudinal stripes, alternating with colourless transparent stripes (fig. 141); this is especially conspicuous when the entire polyp is transparent, as is described above for some specimens. The oral cone may be very broad, as is figured in figs. 131*a*, 132*a*, but may also be less conspicuous.

Fig. 139. *Stichopathes variabilis* n. n. Polyps; 7.6 ×.

Fig. 140. *Stichopathes variabilis* n. n. Polyp, perforated by spines; 14 ×.

Fig. 141. *Stichopathes variabilis* n. n. Polyps; 11.3 ×.

From the same station comes a second group, which is much smaller and contains only six specimens, three of which have a spiral colony, two a partly spiral colony and one is irregularly curved. The general habitus of the colony, the dimensions of the spines and the polyps agree with the preceding group, although with a smaller breadth of variability, as might be expected.

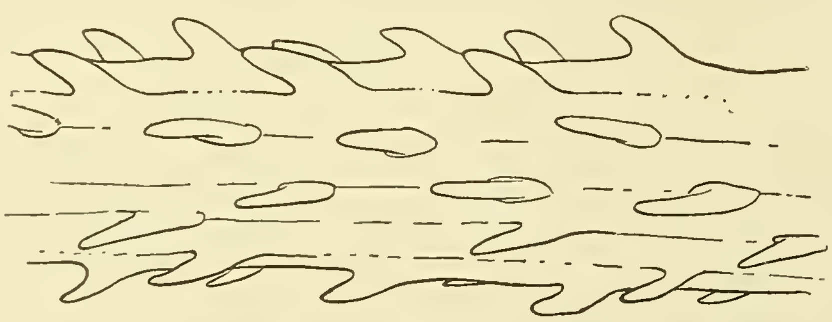

Fig. 142. *Stichopathes variabilis* n. n. Arrangement of the spines; 52 ×; the superficial roughness is omitted.

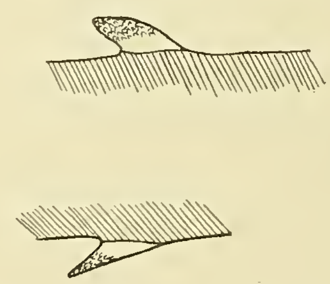

Fig. 143. *Stichopathes variabilis* n. n. Spines on opposite sides of the axis; 52 ×.

The length of the colony is max. 3 dm.; 4 specimens show an increasing diameter in their basal part. The diameter of the spiral coils is 1—5.5 cm., and the distance between the coils is 2.5—9 cm. In 4 specimens there are 7 longitudinal rows of spines; one has 6 rows and one 5 rows; the rows always alternate in a quincunx (fig. 142). The length of the spines is from 150 μ to 450 μ for the longer spines, and from 100 μ to 160 μ for the shorter

spines. All the spines are shaped like fig. 117, but the short spines are sometimes more acute (fig. 143). One of the colonies bears, only on its basal part, the remarkable long spines (type fig. 120 or more straight); the curved top is smooth, just like the base. The mutual distance of the spines is with 5 specimens 450 μ, but with the long-spined specimens 375—600 μ.

The polyps are of the general type of the preceding group (cf. figs. 130, 133, 144). The interpolypar distance is 1—1.5 mm.; the sagittal tentacles are 1—1.5 mm. long, the lateral ones 0.5—0.8 mm. On one colony the row of polyps is wound in a spiral round the axis. — The specimen with the very long spines on its basal part has 6—7 polyps, all of which have very long and thin tentacles, curved round the axis (fig. 145), while the polyps on the higher part of the colony are of the normal type of fig. 130. The length of the tentacles of the basal polyps is more than 2 mm.; this diverging specimen is also the colony, which has only 5 longitudinal rows of spines. This specimen, conspicuous by having long spines, in 5 rows, and long tentacles, would, if it were the only discovered specimen from this station, have been made into a new species, but now it is connected with the other specimens by a colony, which has on its base somewhat larger tentacles than the normal type.

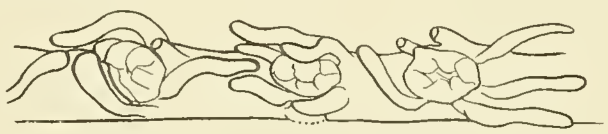

Fig. 144. *Stichopathes variabilis* n. n. Polyps; 11.3 ×.

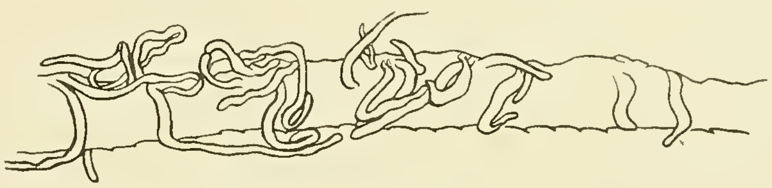

Fig. 145. *Stichopathes variabilis* n. n. Back of the axis, with encircling tentacles; 7.6 ×.

A specimen found in the same station has a partly spiral colony, an increasing diameter in its basal part, a swiftly diminishing diameter on some parts of the axis, with a change in the type of spines, etc. There are 6 longitudinal rows, but there are also parts of the colony which bear only 5 or even 4 rows, without connection with the top of the colony, for parts with 4 rows are followed distally by parts with 6 rows. The type of spine (fig. 126) lies within the limits of the variability of the first great group of Saleyer. The same holds good for the length of the spines (135 μ and 330 μ), the mutual distance of the spines (750 μ) and the typical doubling of the spines. The polyps are very much like reduced polyps out of the great group (fig. 146). The oral cone has almost disappeared; all parts are very thin and transparent. Sometimes the tentacles are arranged as in fig. 131 *c*, in a crowded group. — The interpolypar distance is 1.5—1.75 mm. — The longitudinal groove along the back of the colony is very clearly visible.

Fig. 146. *Stichopathes variabilis* n. n. Polyps; 15.75 ×.

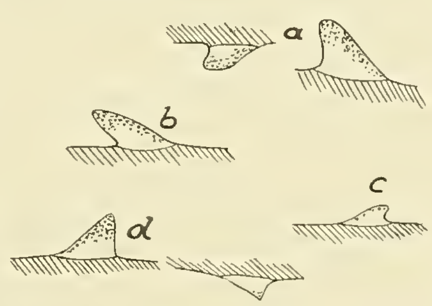

Fig. 147. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on a higher part; *c* on the thickest part; *d* on the top-half; *a*, *b*, *c*, *d* 52 ×.

Fig. 148. *Stichopathes variabilis* n. n. Polyp; 15.75 ×.

Three other colonies, from the same station, agree with the general type of the great group. There are always 7 longitudinal rows; length of the spines: 120—165 μ for the long ones and 75—105 μ for the short spines. Mutual distance usually 525 μ, but this may diminish to 375 μ. The type of spines (fig. 147) agrees very well with the great group. The polyps are completely

like fig. 128, with an interpolypar distance of 1.25—1.5 mm. Sagittal tentacles 0.75—1 mm., lateral ones 0.75 mm. One of the colonies has polyps (fig. 148) with knobshaped, shorter tentacles, 0.22 mm. long.

Stat. 77. 3° 27′ S., 117° 36′ E. Borneo-bank. 59 M. Fine coral sand. 4 spec.

Two of these colonies are partly wound in a spiral, while the other two are irregularly sinuous. All 4 specimens show the increasing diameter in their basal part, and the other characteristics, also the abnormal ones, of the general type. Two colonies have a complete base with basal plate, which is round, darkbrown, with a diameter of 165 μ., and surrounded by a lightyellow border, 65 μ. broad; the basal diameter of the axis is 450 μ. and increases to 600 μ. — There are 7 longitudinal rows of spines, sometimes diminishing to 6 rows; in one colony there are everywhere 8 rows. The length of the spines is 105—155 μ. for the long ones, 55—90 μ. for the short ones on the opposite side of the axis. The mutual distance is 375—525 μ. Usually they have the normal type of fig. 116*a*, but they may be more upright on the axis. One of the colonies has spines of the type of fig. 123, which however also occurs twice among the deviations of the great group. The polyps are like fig. 138, but the tentacles may be somewhat shorter; the diameter of the oral cone is 200 μ.; the interpolypar distance is 1.3 mm.

Stat. 53. Bay of Nangamessi (Sumba). Up to 36 M. Coral sand. 4 spec.

Three of the four specimens have a stem, wound in a sinistrorsal spiral, while the fourth specimen is a fragment of too short a length to make out the shape of the stem. All of them have the normal characteristics of the stem. The spines are arranged in 7 longitudinal rows, sometimes increasing to 8, and in one colony always 6 in number. The shape of the spines

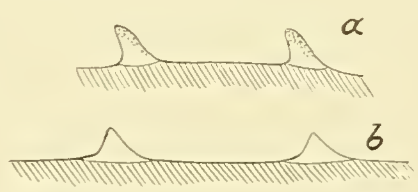

Fig. 149. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on the thickest part; *a*, *b* 52 ×.

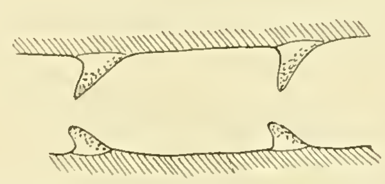

Fig. 150. *Stichopathes variabilis* n. n. Spines; 52 ×.

Fig. 151. *Stichopathes variabilis* n. n. Polyp; 21 ×.

(figs. 149*a* and 150) agrees with the general type or its deviations; sometimes the spines have a smooth surface (fig. 149*b*). The long spines are 80—120 μ., the short spines 70—75 μ.; their mutual distance is 375—480 μ. The polyps, at an interpolypar distance of 1.5 mm., have the type of fig. 151, very much like figs. 130 and 137, while their profile is very much like fig. 134.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. Near Kei-islands. 90 M. Sand, coral and shells. 1 spec.

This colony is wound in a dextrorsal spiral, with a complete base, fixed on an irregular round plate, 3.5 mm. in diameter and the border of which is 0.5 mm. wide and lightbrown. The basal diameter of 760 μ. diminishes gradually towards the top. The spines are arranged in 8 to 9 longitudinal rows, which number diminishes to 6 in the higher parts of the colony;

through a shifting of the rows they are sometimes at irregular levels, compared with one another, while also an arrangement in verticils may occur. The spines are 80 μ and 30 μ long, but

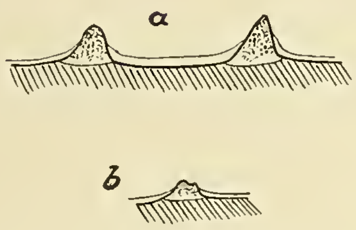

Fig. 152. *Stichopathes variabilis* n. n. Long spines (*a*) and short one (*b*) on the base and the middle of a colony; *a*, *b* 52 ×.

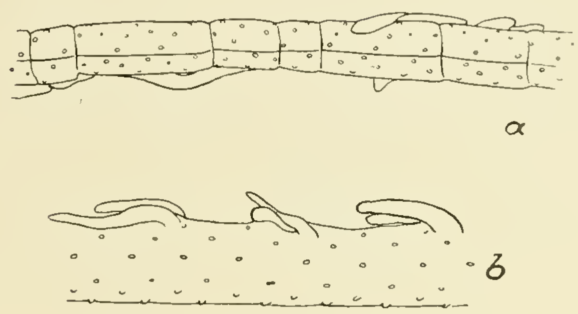

Fig. 153. *Stichopathes variabilis* n. n. *a* Back of the axis with grooves; *b* arrangement of the spines; *a*, *b* 11.3 ×.

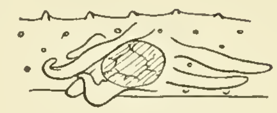

Fig. 154. *Stichopathes variabilis* n. n. Polyp; 11.3 ×.

often the difference between the spines on opposite sides of the axis is less conspicuous; their mutual distance is 390—525 μ. Their shape (fig. 152) is also possible in the wide range of variability of the general type, especially since they may be distally inclined to a higher degree, chiefly on the base of the colony. The polyps (figs. 153, 154) have the characters of the general type, as may be found by comparing these figures with those of the great Saleyer-group.

Stat. 173. 3° 27'.0 S., 131° 0'.5 E. Ceram-sea. 567 M. Fine, yellow grey mud. 1 spec.

This fragment without polyps, 5.5 cm. long, regularly tapering, has 7 longitudinal rows of spines, alternating in a quincunx. Length of the spines: 90 μ and 45 μ, with a mutual distance of 495—525 μ. Their shape (fig. 155) is the same as in the general type; the top is only slightly granulated (indicated only in one of the spines of fig. 155).

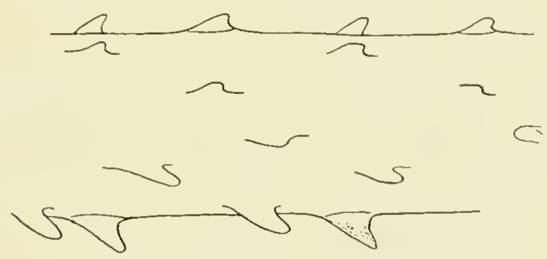

Fig. 155. *Stichopathes variabilis* n. n. Spines; 52 ×.

Stat. 7. 7° 55'.5 S., 114° 26' E. Near Batjulmati (Java). 15 M. and more. Coral and stones. 5 spec.

Three of these specimens have a stem, which is irregularly curved; one specimen has a spiral stem and one colony is partly wound in a spiral. The length of the stem is at the utmost 1.5 dm. In two of the colonies the diameter increases in the basal part, before diminishing. There are 8—9 longitudinal rows of spines, alternating in a quincunx; one colony has 6 rows and another only 5; it is true that both are only thin fragments but usually the number of rows is already constant on the higher parts of a colony. — The length of the spines is 60—195 μ for the long ones and 35—125 μ for the short spines; their mutual distance is 405—675 μ, usually rather variable on various levels on one and the same colony; there is an inclination to a greater mutual distance when the length of the spines is greater. The shape of the spines is rather variable, but the smooth spines of fig. 156 as well

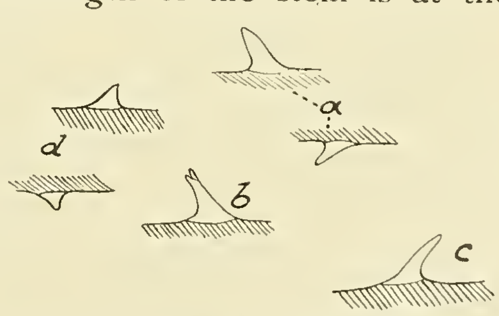

Fig. 156. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* forked spine on the base of the colony; *c* on higher part; *d* on the top; *a*, *b*, *c*, *d* 52 ×.

as the more granulated and more heavily built spines of figs. 157, 158, 159 *a* are all of them to be met with among the spines of the great Saleyer-group or are very much like them. The type of polyp diverges in a rather high degree from the general type. The tentacles are much shorter and more heavily built, sometimes not more than knobs, while the oral cone is basally constricted and widens in its upper part, with a larger mouth, which has a definite lip (figs. 159, 160,

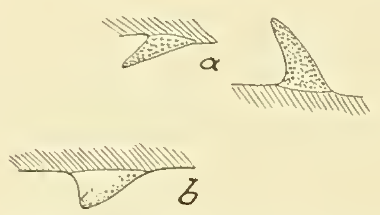

Fig. 157. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on a higher part; *a*, *b* 52 ×.

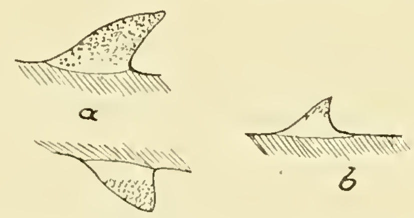

Fig. 158. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on a higher part; *a*, *b* 52 ×.

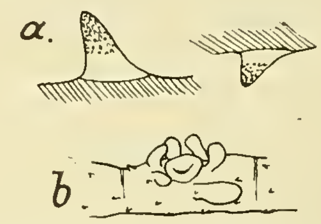

Fig. 159. *Stichopathes variabilis* n. n. *a* Spines; *b* polyp; *a* 52 ×.

161). The interpolypar distance is 0.75—1.5 mm., while the sagittal tentacles are 0.5—1 mm. long and the lateral ones 0.35—1 mm. On one of the colonies the oral cone has clear broad white stripes, separated from each other by narrower grey stripes (fig. 160 *b*) just as is described for one of the polyps of the great Saleyer-group. — The cross-grooves between the polyps are usually very well visible, while the longitudinal groove on the back of the axis is also very

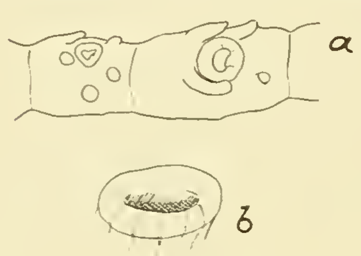

Fig. 160. *Stichopathes variabilis* n. n. *a* Polyps; *b* oral cone; *a* 14 ×.

Fig. 161. *Stichopathes variabilis* n. n. Polyps; 21 ×.

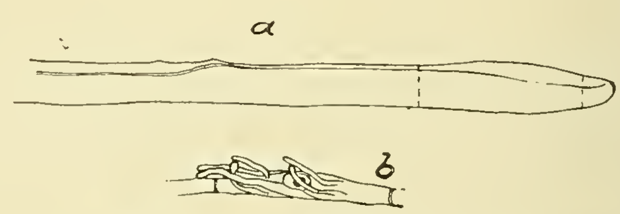

Fig. 162. *Stichopathes variabilis* n. n. *a* Top of a colony with longitudinal groove; *b* polyp; *a* 78 ×; *b* 21 ×.

conspicuous and ends at a short distance from the top, becoming thinner and thinner (fig. 162). Generally these polyps are much more conspicuous than in the general type of the great Saleyer-group; they are rather prominent. Sometimes the tentacles lie against each other and over the oral cone. — On one of the colonies the polyps in the basal part of the colony have the type, described above here but in the higher parts of the colony the polyps are more like the general type of the great group (cf. fig. 130); the tentacles are longer, more slender and more transparent, and the entire polyp is not so very conspicuous (fig. 162 *b*). On one of the other colonies the polyps are so very low as to be hardly visible on the axis. — Repeatedly young polyps are inserted between the adult ones (fig. 161), sometimes alternating rather regularly with them. Remarkable is that on the wall of the oral cone of adult polyps sometimes small tentacles are formed, which makes one think about the forming of young polyps, as is observed by me with one of the *Eucirripathes* species (*Eucirr. contorta* v. P.) — An other remarkable fact is figured in fig. 163; on the

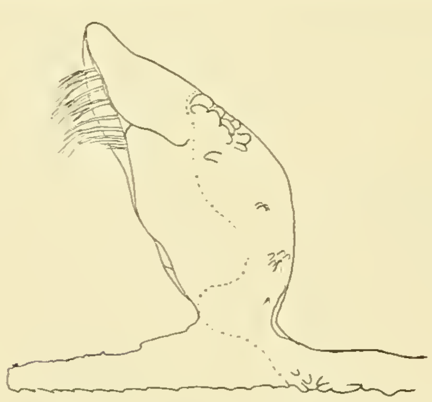

Fig. 163. *Stichopathes variabilis* n. n. Lepadide, overgrown by the coenenchyma and polyps, as far as the dotted line; 7.6 ×.

base of one of the colonies a Lepadide is fixed, which for a large part is covered with coenenchyma and polyps (as far as the dotted line in the figure). The polyps on this covering are not entirely normal; sometimes only a tentacle, sometimes a large crowded group of tentacles is seen, without it being possible to make out with certainty how many polyps make this group. I think it worth noting that the coenenchyma has covered a foreign object, which character is the same as the typical quality of the subtribe of the Crustosae! — On that part of the colony which follows distally after the Lepadide, the polyps are over a distance of 1 cm. more crowded than usually; their interpolypar distance is max. 0.75 mm. [1]).

var. *lissispina* var. n.

Stat. 240. Banda. From 9—45 M. Black sand, coral. 35 spec.

This large group contains 35 specimens, which only in a few cases are fragments of a colony. A sinistrorsal spiral stem is found with 10 specimens; 6 colonies are partly spirally wound, partly irregularly curved, while the other specimens (19) are all of them irregularly curved or sinuous, without showing a spiral coil or even part of a spiral anywhere. With 23 specimens the diameter, which is max. 300 μ at the broken base, increases at first towards the top, which is slender. The length of the colony is max. 21 cm. A suddenly diminishing diameter also occurs, with a change in the type of spines; sometimes large parts of the colonies are of subequal diameter.

The spines are arranged in 6 longitudinal rows, and in some specimens this number diminishes to 4 on part of the colony, but never on the entire colony; however there are specimens which have 5 or 7 rows on the entire colony. The rows alternate in a quincunx, but on some parts they are at an irregular level with respect to each other. — The length of the spines is from 75 to 315 μ for the long spines and 45 to 200 μ for the short spines. Their mutual distance is 315 to 560 μ, but mostly 450 μ, while the greatest distance is often found with the longest spines. — The shape of the spines is not variable to such a degree as in var. *asperispina*. Four fifth of the number of colonies have the type of spines of fig. 164 *a* on the entire colony or on its greatest part. These spines are long, slender, smooth, distally inclined, with a convex proximal side and a concave distal side. Sometimes the base is somewhat more elongated than in the figure, and the apex may be more acute. On the base of the colony the spines are triangular with their distal side at right angles with the axis (fig. 164 *b*) and some fragments are entirely covered with this type, which may also have a more blunt apex (fig. 165). The smoothness of the spines is no universal character in this group, for a few spines of a

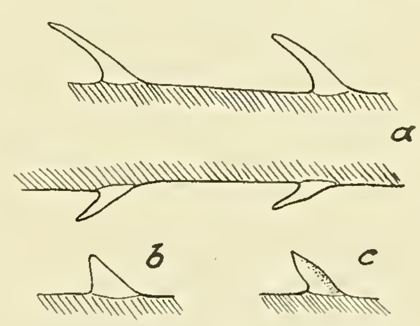

Fig. 164. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* 4 cm. higher, *c* near the top; *a*, *b*, *c* 52 ×.

1) Johnson describes for *Aphanipathes Wollastoni* numerous *Oxynaspa celata* fixed on the colony, and the valves of which are covered with a thin horny layer bearing numerous little spines. — Thomson and Simpson in the description of *Antipathella rugosa* T. & S. make the following remark: "the colony bears numerous epizoic animals: — Cirriped galls and stalked barnacles, tubes of *Spirorbis*, several Polyzoa, a sponge, and a young pearl oyster shell. It is worthy of note that the majority of these are overgrown by the coenenchyma and bear both polyps and spines."

colony may be slightly granulated, especially on the proximal side (fig. 164 *c*), while on one colony the type of fig. 166 is found, which spines are entirely rough or at the utmost have

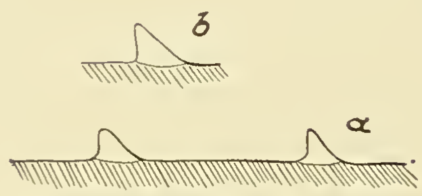

Fig. 165. *Stichopathes variabilis* n. n. Spines: *a*, *b* 52 ×.

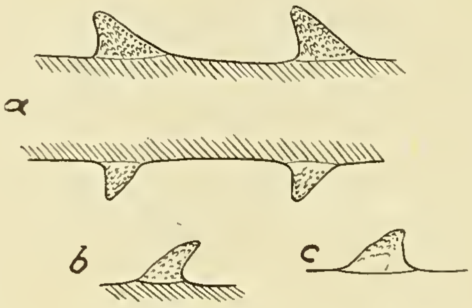

Fig. 166. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on the middle-part; *c* abnormal spine; *a*, *b*, *c* 52 ×.

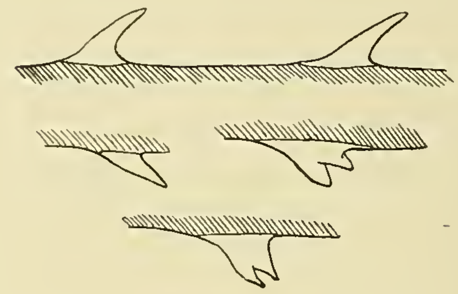

Fig. 167. *Stichopathes variabilis* n. n. Spines on the base of a colony; 52 ×.

a smooth base; this type is entirely like the type of spines of var. *asperispina* or one of its numerous variants. — In these group also many smaller deviations are observed; the spines may be often doubled to various degrees. Every transition may be found from a complete doubling in the same row behind each other or next to each other to a doubling, as is figured in fig. 167 and to a doubling as in fig. 168, where it is rather more like an exceedingly rough top. In the latter case the type of spines is sometimes very much like the branched spines of var. *longispina*. Sometimes the top of the spines is very rough, which may be considered as a beginning of a doubling of the apex (fig. 169 *a*). On one of the colonies the

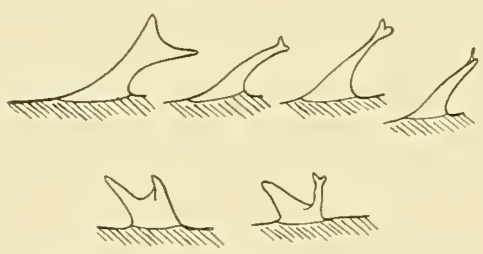

Fig. 168. *Stichopathes variabilis* n. n. Forked and branched spines on the base of a colony; 52 ×.

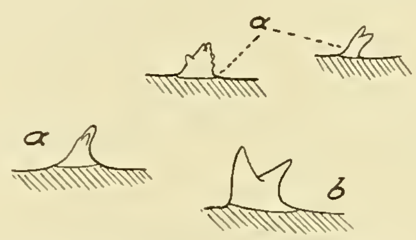

Fig. 169. *Stichopathes variabilis* n. n. Spines: *a* knobby spines on the base of a colony; *b* forked spine on a higher part; *a*, *b* 52 ×.

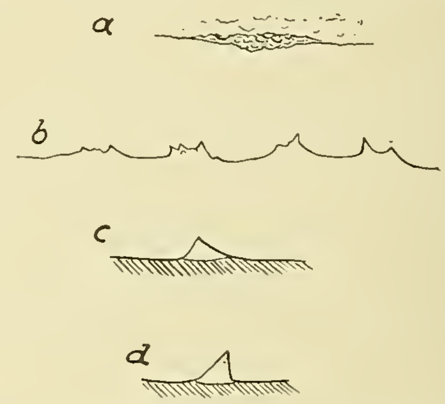

Fig. 170. *Stichopathes variabilis* n. n. Spines: *a* horny mass on the base of a colony; *b* profile of irregular spines on the base; *c*, *d* normal spines; *a*, *b*, *c*, *d* 52 ×.

normal spines are on some parts substituted by very reduced spines, consisting of a knobby low mass (fig. 170 *a*) while the rest of the axis is covered with scattered granulations; they may also be somewhat higher but with a very irregular profile (fig. 170 *b*).

The type of polyp is figured in fig. 171; the polyps are brown. Usually the tentacles are lying in a group against each other around the oral cone, which is covered by them; the

Fig. 171. *Stichopathes variabilis* n. n. Polyps; 14 ×.

Fig. 172. *Stichopathes variabilis* n. n. Polyps; 14 ×.

mouth is round. The profile of the polyps is sometimes very much like fig. 131 *b* from the great Saleyer-group. Sometimes the tentacles are longer and joined in a distally directed group (fig. 172).

All the other characters agree, as well those described here, with the type of polyp of var. *asperispina*. The cross-grooves and the longitudinal groove are clearly visible. The interpolypar distance is 0.8—1.75 mm., usually 1.5 mm. The sagittal tentacles are 0.4—1.4 mm. long, the lateral ones 0.25—0.8 mm. However there are also polyps the tentacles of which are much longer than on the rest of the colony, perhaps through the influence of preservation. The type of fig. 130 is also found as well as the type of fig. 137 with thinner coenenchyma and long thin tentacles. Young polyps may alternate rather regularly with the adult ones, but, as usual, they are especially to be found on the toppart of the colony.

The second group of the same station consists of 6 specimens, one of which is a spiral, while three of them are partly spiral and the other two are only irregularly curved and sinuous. There are 5 or 6 longitudinal rows, sometimes 4; the mutual distance of the spines is 300 to 450 μ, the long spines are 60 to 210 μ, the short spines 30 to 150 μ; the spines of 3 specimens are the same as the general type in the first group (fig. 164 *a*), but the other ones have the triangular spines which are also to be found in the first group (fig. 164 *b*).

On one of the colonies part of the stem is provided with spines the top of which is granulated (fig. 173 *a*). Abnormal spines also occur, i. a. branched ones; more than one apex on the same spine is a very widely distributed phenomenon with the young spines on the top of the colony. The polyps are built on various colonies as in fig. 174 *b*, where the heavily built tentacles, with a constricted base, diverge very widely so that the oral cone is clearly visible, hollow above. Sometimes the tentacles are rather transparent; the lateral tentacles may lie against each other and the oral cone (fig. 174 *a*). Although this type of polyp is not immediately to be included into the range of the variability of the general type of polyps, as they are given in the discussion of var. *asperispina*, it may yet be considered as appertaining to that series of polypforms, as on the same colony the here described polyps may be found together with the type of fig. 130, which we have considered as the general one; also the polyps of fig. 137 may be found, with transparent thin coenenchyma. — The interpolypar distance is 0.75—1.5 mm.; the sagittal tentacles are 0.3—0.85 mm. long, the lateral ones 0.2—0.6 mm.

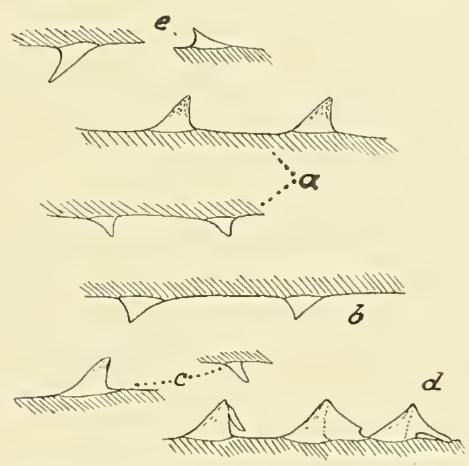

Fig. 173. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on the thickest part; *c* on a higher part; *d* abnormal spines; *e* on the top of the colony; *a*, *b*, *c*, *d*, *e* 52 ×.

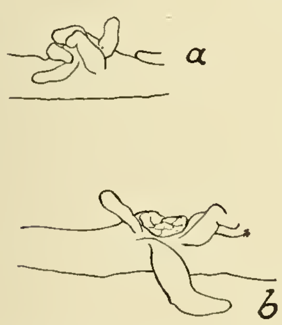

Fig. 174. *Stichopathes variabilis* n. n. Polyps: *a* on the base of a colony; *b* on its middlepart; *a*, *b* 14 ×.

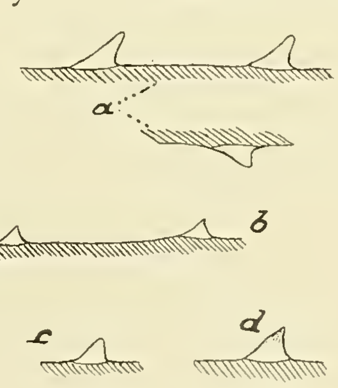

Fig. 175. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b*, *c*, *d* on higher parts; *a*, *b*, *c*, *d* 52 ×.

Stat. 47. Bay of Bima. 55 M. Mud with patches of fine coral sand. 1 spec.

The type of spines (fig. 175) of this colony, which is wound in a sinistrorsal spiral, made me put it with this var., although there are no polyps. The stem

agrees with the general type. The spines are 180 μ and 110 μ long, and their mutual distance is 450—475 μ.

var. *longispina* var. n.

Stat. 318. 6° 36'.5 S., 114° 55'.5 E. 88 M. Fine, yellowish grey mud. 3 spec.

The colonies, entirely or partly spiral, with an increasing diameter in the basal part, are max. 23 cm. long and their shape agrees with the general type.

There are always 6 longitudinal rows of spines, on one colony sometimes 5 or 7, alternating in a quincunx; the spines are very long and the length is 375—600 μ with the long spines, and 180—225 μ with the short ones. The mutual distance is also very great, viz. 550—750 μ, usually over 600 μ. Characteristic for this variety is, beside the length of the spines, their shape which was also present in some specimens of var. *asperispina* (fig. 120). They are very long, slender, curved distally (especially the top, which may become parallel to the axis), granulated except at the base of the spine (fig. 176 *a*). In the top-part of the colony the spines are much shorter and they have a smooth surface (fig. 176 *b*). The short spines at the opposite side of the axis are shaped as the short ones of fig. 120, straight and distally inclined. — The length of the spines does not diminish regularly from the base of the colony towards the top, but a part where the shorter spines occur is sometimes followed by a part with increasing length of spines; so their growth is very irregular. — On one of the colonies branched spines are found (fig. 176 *a*), which are antler-shaped; this type is very much like the beginning of the highly branched spines of *Antipathella rugosa* T. & S. (= *Euantipathes rugosa* T. & S.), except that the latter spines are at right angles with the axis.

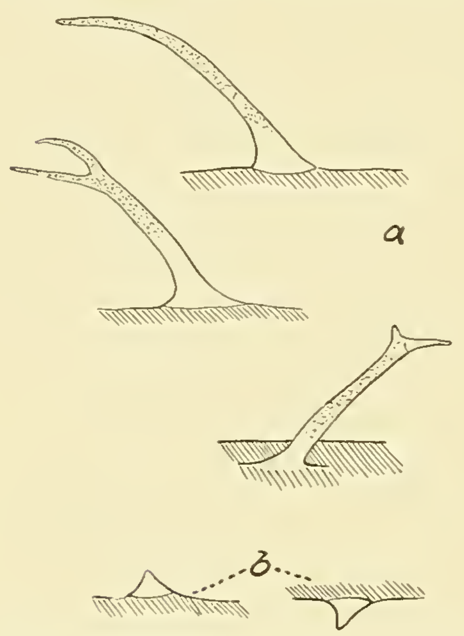

Fig. 176. *Stichopathes variabilis* n. n. *a* Spines on the base of a colony; *b* on its top; *a*, *b* 52 ×.

The polyps are of the same type as fig. 130; their interpolypar distance is 1.5—3.75 mm., but it is not impossible that the greater distance is to be explained by the interpolating of young polyps between the adult ones; as the polyps are rather badly preserved, it is possible that the young polyps are invisible, so that the interpolypar distance looks too large.

Stat. 50. Bay of Badjo, Flores. Up to 40 M. Mud, sand and shells. 1 spec.

This colony, without polyps, completely agrees in shape of stem and spines with the colonies of the first group (station 318).

There are 5 longitudinal rows of spines; length of the spines: 330 μ and 150 μ; mutual distance 525—550 μ. In the higher part of the colony the length of the spines diminishes so much that the spines on one side of the axis disappear entirely on part of the stem.

Stat. 313. Saleh-bay, East of Dangar Besar. Up to 36 M. Sand, coral and mud. 2 spec.

Both specimens have a spiral stem of the normal type. The spines on part of the colonies

are shaped as in fig. 177 *a*, so almost the same as in station 318, but sometimes sinuous.

There are 5 longitudinal rows of spines, sometimes increasing to 6; the long spines are 285—345 μ, the short ones 165—210 μ; their mutual distance is 600—750 μ. On the higher parts of the colonies, as well as on the extreme basal part, the type of spines is as indicated in fig. 177 *b*, *c*, *d*, smooth or sligthly granulated at the top of the spines. Sometimes the young

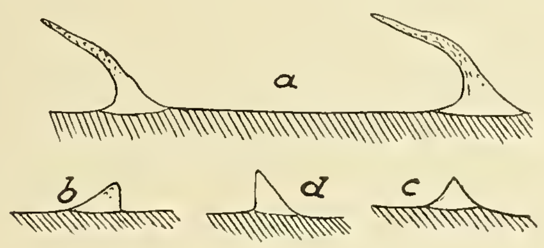

Fig. 177. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b*, *c*, *d* on its higher parts; *a*, *b*, *c*, *d* 52 ×.

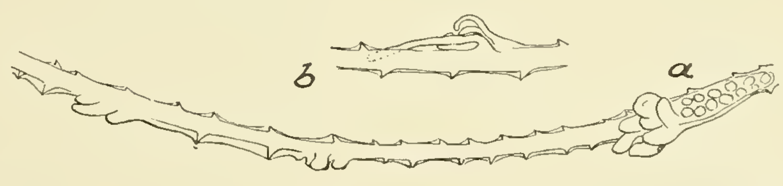

Fig. 178. *Stichopathes variabilis* n. n. Polyps: *a* on the upper half of the colony; *b* on its lower half; *a*, *b* 14 ×.

spines have more than one apex. — The polyps and the coenenchyma are very transparent, so that the ova may be visible through the body wall (fig. 178 *a*) and they are lifted very high by the spines. The tentacles are short and thick (fig. 178 *a*) or, as an exception, long and slender (fig. 178 *b*). Especially the last type agrees very well with the type of polyp of the great Saleyer-group. The sagittal tentacles are 0.45—0.65 mm., the lateral ones 0.27—0.4 mm. The interpolypar distance is large, viz. 2 mm.

Stat. 51. Molo-strait. 69—91 M. Fine grey sand, coarse sand with shells and stones. 1 spec.

This colony is irregularly curved, and 16 cm. long. The spines are arranged in 5 longitudinal rows, alternating in a quincunx; they are 270 μ and 195 μ long, at a mutual distance of 450—750 μ. Their shape (fig. 179) is very much like the general type of this variety, especially fig. 179 *c*, but they are distally inclined to a smaller degree, while their base is much longer. — Since on large parts of the colony spines of the type of fig. 179 *a* and *b* are present, which have an entirely smooth surface, but at the same time are rather long, this specimen is a transition towards the sub-var. *lissispina* of this var. The polyps are badly preservated, but the rests, which are visible (fig. 180) have very long thin tentacles, very transparent just like the coenenchyma. They are very low, and their type may be compared to figs. 145 and 178; the sagittal tentacles are 1.5 mm., the lateral ones 1 mm.; the interpolypar distance is 1.5 mm.

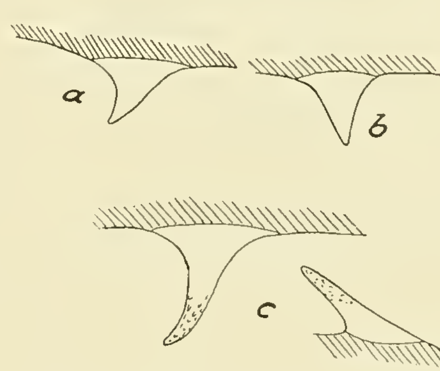

Fig. 179. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* on its thickest part; *c* on its top-part; *a*, *b*, *c* 52 ×.

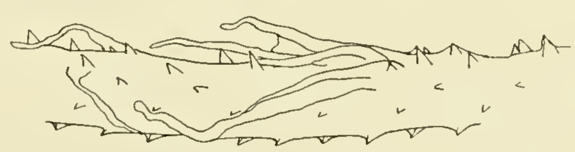

Fig. 180. *Stichopathes variabilis* n. n. Polyp; 14 ×.

Stat. 184. South coast of Manipa-island. 36 M. Coral, sand. 1 spec.

This colony is of the normal type, wound in a spiral. There are 5 longitudinal rows alternating in a quincunx; length of the spines 390 μ and 225 μ; mutual distance 675—750 μ.

Their shape, which at first sight is very much like the general type of this variety, is somewhat more upright on the axis and a granulated surface is to be found only on the distal side of the spine (fig. 181 *e*); the rest of the surface is smooth. The base of the spine is rather elongated, more than in the general type. — These spines are very often branched; both branches may be split as far as the base of the spine; in this manner the spine gets a very curious shape, also since more branches may occur (fig. 181 *d*). In the same figure we can see how both branches may be joined by a horny lamella (*b*), but this lamella may also be present on an unbranched spine (*e*), standing out on the distal side of the spine. — In the higher parts of the colony short spines are found, which often may be double-topped (fig. 182 *a*) and which have a more smooth surface; even the young spines may be double-topped (fig. 182 *c*). The polyps (fig. 183) are more conspicuous and prominent than in the former colony; they are even visible from the back of the colony (fig. 183 *a*) while the oral cone is rather high with a blunt top; the mouth is small and round. The sagittal tentacles are 0.6 mm. long, the lateral ones 0.35 mm., while the interpolypar distance is 2 mm. However the type of polyp is often very much like fig. 159 and others of the same group, so that I have joined this specimen to this variety, although in view of the typical shape of the spines I would have made a sub-variety of var. *longispina* if some more specimens had been found, but the great variability of this and other species was an obstacle.

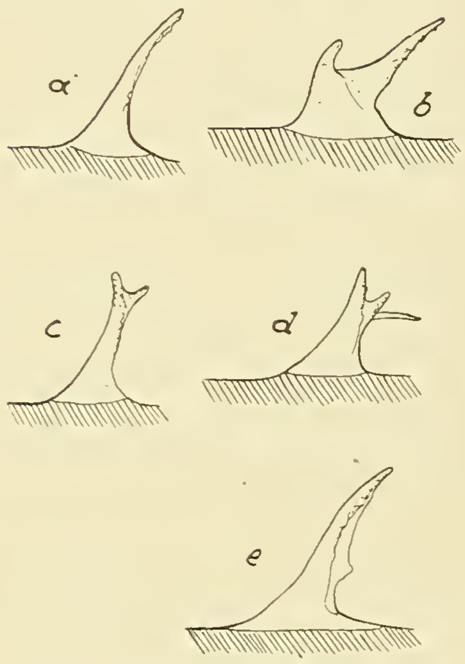

Fig. 181. *Stichopathes variabilis* n. n. Spines forked and branched to a various degree, on the base of a colony; *a*, *b*, *c*, *d*, *e* 52 ×.

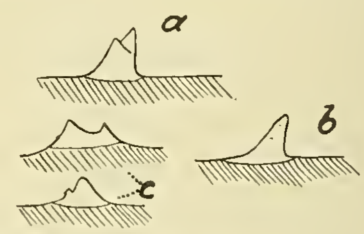

Fig. 182. *Stichopathes variabilis* n. n. Spines near the colony-top: *a* and *c* forked ones; *b* normal one; *a*, *b*, *c* 52 ×.

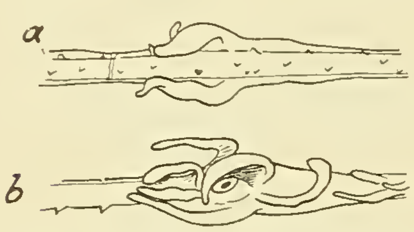

Fig. 183. *Stichopathes variabilis* n. n. Polyps: *a* back view: *b* oral view; *a*, *b* 14 ×.

var. *longispina* var. n., subvar. *lissispina*.

Stat. 33. Labuan Tring (Lombok). 22 M. and less. Mud, coral and coralsand. 1 spec.

This colony, irregularly curved, with an increase of diameter in its basal part, and 37 cm. long, has 4—5 longitudinal rows of spines, alternating quincunxially. The spines are of the same shape as in var. *longispina*, but they are not so much distally inclined, especially as far as the top is concerned, and their surface is entirely smooth (fig. 184). The long spines are 315 μ long and the short ones 135 μ; their mutual distance is (525—) 600 μ. The polyps are entirely absent.

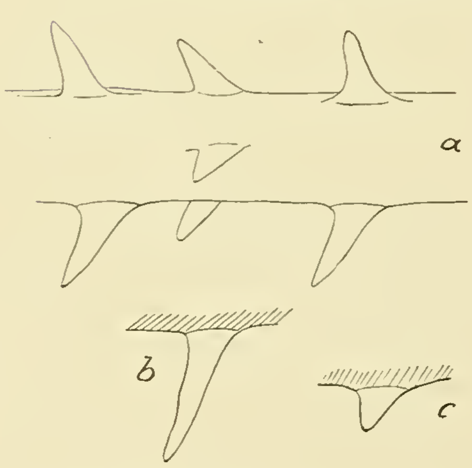

Fig. 184. *Stichopathes variabilis* n. n. Spines: *a* on the base of a colony; *b* above the base; *c* on the thickest part; *a*, *b*, *c* 52 ×.

Stat. 64. Tanah Djampeah, Kambaragi-bay. Up to 32 M. Coral and coralsand. 1 spec.

This specimen is partly wound in a spiral, and has the general type of this species. There are 5 longitudinal rows of spines, alternating in a quincunx. The long spines are 330 μ and the short ones 105 μ, with a mutual distance of (600–)675(–750) μ. The shape of the spines (fig. 185) is more acute than in the former colony; their base is more elongated, but otherwise they are like each other.

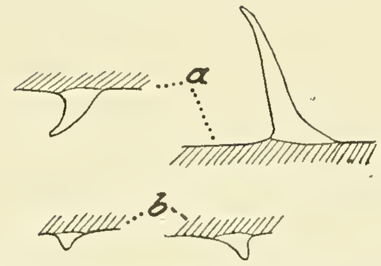

Fig. 185. *Stichopathes variabilis* n. n. Spines: *a* near the base of a colony; *b* near the top; *a*, *b* 52 ×.

Stat. 50. Bay of Badjo, Flores. Up to 40 M. Mud, sand and shells. 1 spec.

This colony, with a spiral stem and an increasing diameter in its basal part, has 6 longitudinal rows of spines; the long spines are 360 μ, the short ones 150 μ; their mutual distance is (525—)675 μ. The shape of the spines is as in fig. 186*a* and 187*b*; they may be doubled (186*b*) or branched (186*c*), while their surface is smooth. The polyps are of the type of fig. 140. On the base of the colony some spines have a slightly granulated top, while the spines are more distally inclined than in the specimens from the other stations. — This sub-variety is intermediate between var. *longispina* and var. *lissispina*, and especially is not very divergent from the latter. There is always a possibility of combining this sub-variety with var. *lissispina* via the specimen from the last station (50).

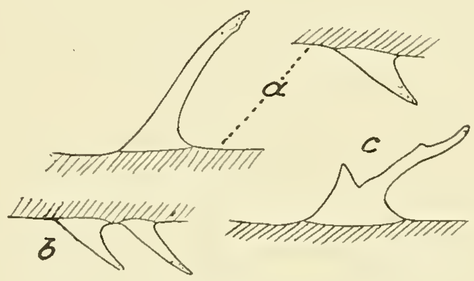

Fig. 186. *Stichopathes variabilis* n. n. Spines on the base of a colony: *a* normal ones; *b* doubled spine; *c* forked spine; *a*, *b*, *c* 52 ×.

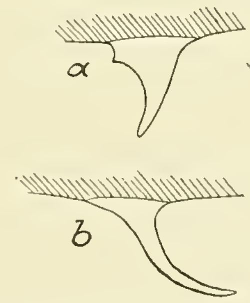

Fig. 187. *Stichopathes variabilis* n. n. Spines on a higher part of a colony: *a* abnormal one; *b* normal one; *a*, *b* 52 ×.

var. *lissispina minor* var. n.

Stat. 64. Tanah Djampeah, Kambaragi-bay. Up to 32 M. Coral and coralsand. 14 spec.

Some of these 14 specimens are fragments, and none of the colonies has polyps. All of them are irregularly curved without showing spiral-coils, except the top of the colony which shows part of a sinistrorsal spiral, the coils of which have a diameter of max. 5 cm. The length of the colony is max. 40 cm.; the diameter increases in the basal part of the stem (e. g. from 350 μ to 600 μ). There are 7 longitudinal rows of spines, alternating in a straight or slanting quincunx; the higher parts of the colonies have sometimes 6 rows. The spines have approximately the general type of var. *asperispina*, but the surface of the spines is almost smooth. The shape of the spines is as in fig. 142. On the top of the colony they are more acute and their base is more elongated, while the spines are entirely smooth. The length of the spines is subequal on every side of the axis viz. 85 μ; on one of the sides the spines are somewhat more slender and longer than on the opposite side. — However there are also colonies or parts of colonies where one of the sides of the axis is entirely smooth, while the opposite side has spines

$\pm$ 30 μ long. — The mutual distance between the spines is 560 μ, but may diminish to 420 μ.

Stat. 117. 1°0'.5 S., 122°56' E. Entrance of Kwandang-bay, Celebes. 80 M. Sand and coral. 50 spec.

These colonies, partly fragments only, have the same type of colony as the specimens from the Bay of Djampeah, and also the same dimensions of the stem. The shape of the spines as well as their habitus are also very like those of the former group; the surface of the spines is practically smooth. There are 5—6 longitudinal rows of spines; the longest ones are 98 μ, the shortest on the opposite side of the axis 28 μ; their mutual distance is sligthly less than in the other group, viz. (420—)480 μ. The very rare polyps have an interpolypar distance of 1.5 mm.; the type of the polyps is the same as in fig. 130, but with a better defined mouth.

The colonies of both these stations I did not join with var. *asperispina* since the smooth surface of their spines is not a sporadically found character but widely distributed in the entire groups, and especially since both groups show an uniformity in the shape of the spines, which forms a conspicuous contrast with the very great variability of var. *asperispina*. The shape of the spines neither permits to combine these groups with var. *lissispina*.

Without any doubt this *Stichopathes variabilis* has points in common with formerly described species, however without making it desirable to unite them completely. *Stichopathes desbonni* D. & M. also grows in groups, while the length is $\pm$ 7 dm.; but the polyps are entirely unknown and the spines are arranged in verticils, while the mutual distance of the spines is $\pm$ 330 μ and the number of longitudinal rows is 10. The spines are short and blunt. The characteristic verticillate arrangement of the spines, although found on very rare occasions also in *Stich. variabilis*, is in *Stich. desbonni* D. & M. probably a character of general validity.

Stichopathes ceylonensis T. & S. also appears to me as a nearly related species, differing from *Stich. variabilis* in the shape of the spines and the number of longitudinal rows, while the further description is too vague to give a reliable base on which a union of both species could be founded, although the characters, as far as they are described, lie within the range of the variability of *Stichopathes variabilis*.

Roule's *Stichopathes Richardi*, *dissimilis* and especially *abyssicola* may surely be compared with *Stich. variabilis*. Neither of them has the typical shape of the colony of *Stich. variabilis*, with an increasing diameter in the basal part. The great likeness to *Stich. abyssicola* is lessened by the bathymetrical difference; *Stich. abyssicola* is found on depths of 1674 and 2165 M, while all the specimens (with only one single exception: 1 spec. from station 173) of *Stich. variabilis* are found on depths of some ten meters or less.

Silberfeld's specimens of *Stichopathes filiformis*, separated by me from this species and called *Stich. variabilis* are very like the Siboga-specimens. The characteristic shape of the stem (i. a. the changing diameter, etc.) makes one immediately think of these specimens, while Silberfeld's data about the shape, the dimensions and the distribution of the spines are not in disaccord with the Siboga-material. The polyps also have many points in common, even the thin mesogloea, which Silberfeld makes mention of for his specimens and which is described by me in the anatomical part.

The specific diagnosis is rather vague, through the existence of many varieties:

Colony: Slender, entirely or partly wound into a loose spiral (usually sinistrorsal, sometimes dextrorsal), with max. three coils, (often less than one) or irregularly curved and sinuous. Length max. 0.5 m.; basal diameter a few hundred μ at the utmost, increasing in the basal part to a height of ± 1 dm. A swift diminishing of the diameter often occurs; for the rest the diameter diminishes gradually. The colonies may grow in groups.

Spines: Very variable in shape and dimensions; of different length on opposite sides of the axis, so that the longest spines are found on the polyp-bearing side of the stem. Arranged in longitudinal rows, alternating in a quincunx.

Polyps: In one single series; not very prominent. Sagittal tentacles inserted at a slightly lower level than the lateral ones, and longer than the lateral ones, which are mutual subequal. Tentacles cylindrical, sometimes with a basal constriction. Broad oral cone, not very high, flat on the upper side, with a small, round or indistinct mouth. (Cross-grooves between the polyps and longitudinal groove on the back of the axis; young polyps alternating irregularly with the adult ones). Interpolypar distance 0.9—2.5 mm. (usually 1.3 mm.); sagittal tentacles 0.6—28 mm., lateral ones 0.4—1.3 mm.

var. *asperispina* (Saleyer-group).

Spines: rather blunt, laterally compressed, distally inclined, convex proximal side, distal side slightly concave at the base of the spine; apex rough, base smooth; the rough surface extends on the proximal side farther down than on the distal side. The shorter spines are more acute and straigther. The longest spines are 75—525 μ (usually ± 150 μ), the shortest spines are 45—200 μ (usually ± 90 μ). Mutual distance 375—900 μ (usually ± 525 μ). Number of longitudinal rows 5—9 (usually 7—8).

var. *lissispina* (Banda-group).

Spines: long, slender, smooth surface, distally inclined, with convex proximal side and concave distal side. The longest spines are 75—315 μ (usually ± 180 μ), the shortest spines are 45—200 μ (usually 90 μ). Mutual distance 315—560 μ (usually 450 μ). Number of longitudinal rows 4—7 (usually 6).

var. *longispina* (Moluccos-group).

Spines: very long (in the basal part of the colony), slender, distally inclined, especially the top of the spine, which may be parallel or subparallel with the axis; rough top, smooth base. The longest spines are 270—600 μ (usually ± 375 μ), the shortest spines are 165—225 μ (usually ± 200 μ). Mutual distance 450—750 μ (usually ± 600 μ). Number of longitudinal rows 5—7 (usually 5—6).

var. *longispina* sub-var. *lissispina*.

Spines: shaped as in var. *longispina* but less distally inclined, especially as to the top of the spines. Surface entirely smooth. The longest spines are 315—360 μ, the shortest spines are 105—150 μ; the mutual distance is 525—750 μ (usually ± 650 μ). Number of longitudinal rows 4—6.

var. *lissispina minor*.

Spines: shaped as in var. *asperispina* but the surface of the spines is practically smooth. The longest spines are 98 μ, the shortest spines are 28 μ; mutual distance 420—560 μ; number of longitudinal rows 5—7.

The here described material of *Stichopathes variabilis* is used by me in making variability-curves for several characters, i. a. for the mutual distance of the spines, the number of longitudinal rows, the length of the spines (choosing only the longest spines), etc. My intention was to get an indication, through eventual multimodal curves, in what manner the rather intricate material might be arranged in local species or varieties. The result was rather unsatisfactory; only the lengths of the spines gave a multimodal curve; one of its tops was found at the length of 140—160 μ, while a secondary lower top was lying in the neighbourhood of 320—340 μ; on comparing the length of the spines with var. *asperispina* and with var. *longispina* this multimodal curve is quite comprehensible, although it should be kept in mind that in the tracing of the curve the rough or smooth surface of the spines of other varieties is not taken into account, and more of such characters which would have altered the curve, probably in a high degree. — On choosing only the smooth spines, by which method however the material is so very diminished in quantity as to make it properly speaking nearly unavailable for the tracing of reliable curves, I got a multimodal curve with a top at 160—200 μ, so at an average of 180 μ as I found for var. *lissispina*, and a top at 360—400 μ, which is in good accordance with the average of 375 μ for var. *longispina*. Although the curves gave no conclusive proof of the division in species and varieties, it is neither possible to use them as arguments against my division in varieties.

4. *Stichopathes semiglabra* sp. n.

Stat. 47. Bay of Bima. 55 M. Mud with patches of fine coral sand. 4 spec.
Stat. 204. 4° 20′ S., 122° 58′ E. Between islands of Wowoni and Buton. 75—94 M. Sand with dead shells. 5 spec.

From these colonies the longest one is 54.5 cm., with a basal diameter of 100 μ, but this diameter increases exceedingly and is 540 μ on a height of 7 cm. above the base; the further part of the colony tapers gradually. This same character is also found in the other three colonies. — Except for the first part of the colony which is nearly straight for a distance of ± 1 dm., the colonies are wound in a loose sinistrorsal spiral, consisting in three coils with a variable diameter; the stem is always slender, as is the top. On some parts of the colony the diameter diminishes swiftly, while the thicker parts of the axis sometimes bear warts (fig. 188 *a*). Therefore in many points the colonies are very much like those of *Stichopathes variabilis*.

The spines vary in length but they are always unequal on opposite sides of the axis; the longest are inserted on the polyp-bearing side. The shortest spines may so very much

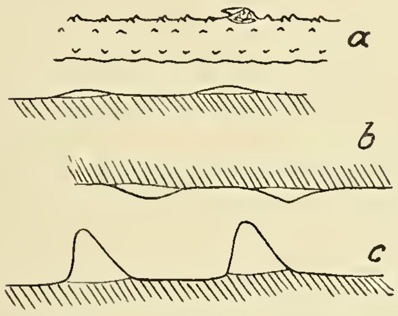

Fig. 188. *Stichopathes semiglabra* sp. n. *a* Arrangement of the spines on the thickest part of the colony; *b* on the base of the colony; *c* on a higher part; *a*, *b*, *c* 52 ×.

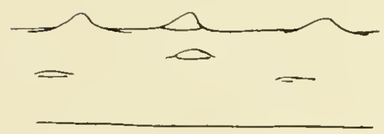

Fig. 189. *Stichopathes semiglabra* sp. n. Spines on the base of a colony; 52 ×.

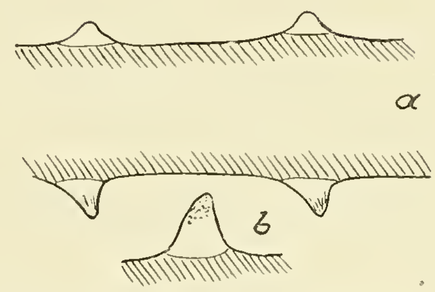

Fig. 190. *Stichopathes semiglabra* sp. n. *a* Spines on the base of a colony; *b* on a higher part; *a*, *b* 52 ×.

diminish in size as to leave one side of the axis entirely smooth, without any trace of spines (fig. 189); this character is found with all the specimens on one or more parts of the axis. — If there are spines on every side of the axis, there are 4—7 longitudinal rows, usually 5 (fig. 188 *a*). The mutual distance of the spines is 330—600 μ, usually 450—480 μ; on one and the same part of a colony this mutual distance is everywhere the same in all the rows so that the quincunxial alternation of the rows is not disturbed.

The length of the spines varies for the longest ones from 45—190 μ, for the shortest ones from 0—75 μ. The spines are usually blunt, conical, slightly distally inclined, but their distal side is not yet at right angles with the axis; the surface of the spines is smooth (fig. 188 *c*), but in some cases slightly granulated (fig. 190 *b*) or slightly striped (fig. 190 *a*) on the top of the spines. The spines may be more distally inclined (fig. 191 *a*, *b*, *c*, *d*), with which

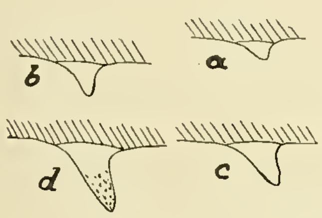

Fig. 191. *Stichopathes semiglabra* sp. n. *a*—*d* Spines on succeeding parts of a colony, beginning at its base; *a*—*d* 52 ×.

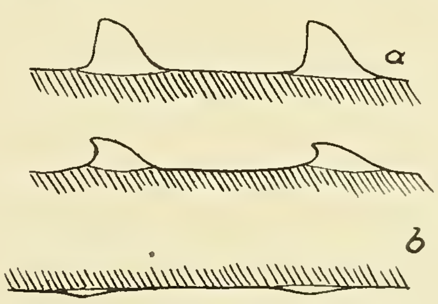

Fig. 192. *Stichopathes semiglabra* sp. n. Spines: *a* on the middle of a colony; *b* on its top; *a*, *b* 52 ×.

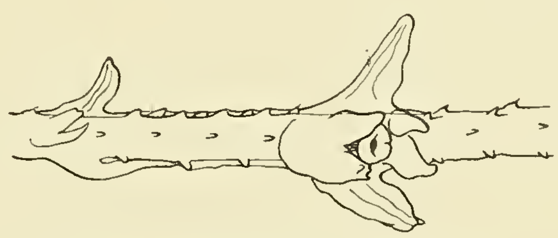

Fig. 193. *Stichopathes semiglabra* sp. n. Polyps; 14 ×.

a granulated top may be observed (*d*) or the spines are more heavily built as in fig. 192 *a* with a curved proximal side and a straight distal one, while with the last type the distal side may also be concave (fig. 192 *b*). If the length of the spines is locally very much diminished, we find a transition-zone with high knobs (fig. 188 *b*). — The polyps (figs. 193, 194) are very transparent, like the rest of the coenenchyma, so that the axis and the gastral cavity are clearly visible. The polyps are rather prominent and conspicuous as small cushions on the axis. The interpolypar distance is 1.7—1.8 mm. The sagittal tentacles are 0.7 mm. long, the lateral ones 0.45—0.5 mm.; the sagittal ones are inserted at a lower level than the lateral

Fig. 194. *Stichopathes semiglabra* sp. n. Polyps; 14 ×.

tentacles. The tentacles are broad and heavily built, with a very broad base; they are very much like flat triangular plates (cf. fig. 194). The oral cone is high and domeshaped, projecting 225 μ even above the insertion of the lateral tentacles. The entire cone is distally inclined, as to give the impression that the proximal lateral tentacles are at a higher level than the distal ones, although they are sub-equal in length. All the lateral tentacles are directed distally just like the sagittal ones, but the round small mouth is visible. Young polyps alternate irregularly with the adult ones. The long spines project through the coenenchyma, but not through the polyps. — The very diverging type of polyp together with the partial smoothness of the axis, present in all specimens, have induced me, in connection with the microscopical anatomical differences, to form this species although the shape of the axis is very much like the axis of *Stichopathes variabilis*, while the shape of the spines might be compared with some spines of the very variable variety of *Stich. variabilis*, viz. var. *asperispina*. The diagnosis is:

COLONY: length ± 0.5 m.; basal diameter (± 100 μ) increases before diminishing; wound in a loose, sinistrorsal spiral except the straight base (± 1 dm.); occasionally swiftly diminishing diameter.

SPINES: of unequal length on opposite sides of the axis: longest ones are 45—190 μ, shortest ones 0—75 μ. Parts of the axis are on one side entirely smooth. — Number of longitudinal rows: 4—7 (usually 5). Mutual distance of the spines 330—600 μ (usually 450—480 μ). Blunt, conical, sligthly distally inclined, smooth or rarely with a slightly granulated top.

POLYPS: prominent, distally inclined. Interpolypar distance 1.7—1.8 mm. sagittal tentacles 0.7 mm., lateral ones 0.45—0.5 mm. High, domeshaped, distally inclined oral cone with small round mouth. Proximal lateral tentacles inserted at a higher level than the distal lateral ones. Tentacles broad, flat, triangular.

5. *Stichopathes aggregata* sp. n.

Stat. 213. Anchorage off Saleyer. Up to 36 M. Mud and mud with sand. 1 spec.

This colony is irregularly curved and very slender. The length is 12 cm. with a basal diameter of 135 μ. On a short distance above the base there is a local increase in diameter, after which the diameter remains sub-equal (120 μ) before diminishing regularly towards the slender top. The spines (fig. 195) are smooth and at right angles with the axis; the higher in the colony the spines are inserted, the more acute their top is (fig. 195*c*), while also double-topped spines occur (fig. 195*b*), behind each other. The spines on opposite sides of the axis are sub-equal: ± 45 μ. Their mutual distance is rather variable (300—375 μ) often on one and the same part of the colony. There are 5—6 longitudinal rows, either alternating in a straight or slanting quincunx, or on the same level, or without any further regularity, through the variable distance of the spines, but the rows themselves are always regular.

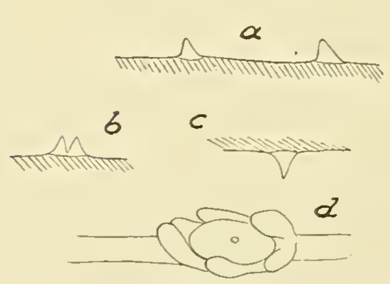

Fig. 195. *Stichopathes aggregata* sp. n. *a* Spines on the base of the colony; *b* doubled spine; *c* spine on a higher part of the colony; *d* polyp on the base of the colony; *a*, *b*, *c* 52 ×; *d* 14 ×.

The polyps (figs. 195*d*, 196), placed in a single series, are very well preservated and strikingly white, not transparent. The interpolypar distance is 2 mm. or more; in the top-part of the colony they are, as usually, a little more crowded. Alternating rather regularly with the adult polyps young ones occur. The tentacles are short, cylindrical, thick; the sagittal ones are 0.35 mm. long, the lateral ones 0.3 mm. They may be all of them distally inclined (fig. 195*d*) or they are upright on the axis, or with their tops inclined towards each other, however without covering the oral cone. Since the polyps are visible as little cushions on the axis, and in this manner are thicker than the interzooidal areas while the polypar diameter gradually increases, the colony is very like a series of spindle-shaped thickenings (fig. 196*a*); in the thinnest part the cross-groove is visible. The polyps are principally so very promiment through the oval, transversally elongated oral cone, the diameter of which is 450 μ. The mouth is small (fig. 195*d*) with a diameter of 75 μ. — The longitudinal groove along the back of the axis is also clearly visible.

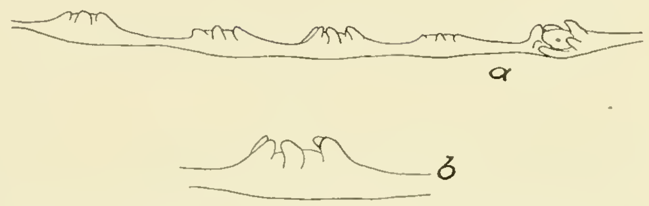

Fig. 196. *Stichopathes aggregata* sp. n. *a* Polyps on the top-part of the colony; *b* one of these polyps; *a* 7.6 ×; *b* 14 ×.

This type of polyps is very much like the polyps of *Euantipathes dichotoma* (cf. especially the polyps of *Antipathes furcata* figured by SCHULTZE in his Valdivia-Antipatharia Pl. XIV, figs. 10 and 11), as well as the shape and other characters of the spines, while the microscopical anatomical details are in many points concordant (cf. the anatomical part). I have called this species *aggregata*, while the name of *Stich. dichotoma* would be less appropriate, but the probability is very great that we have a young, still unbranched specimen of *Euantipathes dichotoma*, which would be another demonstration of the vague limit between Indivisae and Ramosae. The diagnosis is as follows:

COLONY: irregularly curved, slender; length 12 cm. with a basal diameter of 135 μ.

SPINES: smooth, triangular, acute, at right angles with the axis. Subequal in length: 45 μ.; mutual distance 300—375 μ.; 5—6 longitudinal rows.

POLYPS: spindle-shaped; interpolypar distance 2 mm. or slightly more. Tentacles cylindrical; sagittal ones 0.35 mm. lateral ones 0.3 mm. Large oval, transversally elongated oral cone, with small round mouth.

6. *Stichopathes saccula* sp. n.

Stat. 262. 5° 53.8 S., 132° 48'.8 E. Between Kei-islands. 560 M. Solid bluish grey mud. 1 spec

This colony is 18.5 cm. long, upright but slightly curved. The base is complete, but it is fixed on the underground without broadening into a basal plate. The basal diameter of 1.2 mm. diminishes regularly to a height of 7 cm., where the diameter suddenly diminishes from more than 1 mm. to 0.65 mm. (fig. 200). On a height of 1 cm. and 2 cm. above the base the same fact takes place but to a minor degree. On a height of 11.5 cm. there is a fourth striking diminuition in diameter. The top is slender.

The spines (fig. 197) are blunt conical, at right angles with the axis, seldom slightly inclined. Their surface is entirely smooth or very finely granulated. In the higher part of the colony the spines are more distally inclined. The length, equal or subequal on every side of the axis, is 90—100 μ at the base of the colony and 75—90 μ on the opposite side, with a mutual distance of 450 μ. On this basal part there are 11 longitudinal rows, which are not entirely regular; sometimes a quincunx is visible. — In the higher part of the colony there are less longitudinal rows: 8—9 after the third diminuition in diameter, and the distribution here is somewhat more regular. — Except for the base, the colony is entirely covered with well preservated polyps, arranged in a single series, with an interpolypar distance of 2 mm.; they are very prominent and project far from the axis (figs. 198, 200). The sagittal tentacles, which sometimes stand off laterally from the axis, are inserted at an exceedingly lower level than the lateral ones. The latter tentacles are inserted on a very high oral cone with a sagittally elongated mouth, the walls of which are folded; sometimes the mouth is smaller and more rounded (fig. 199). The oral cone projects as a

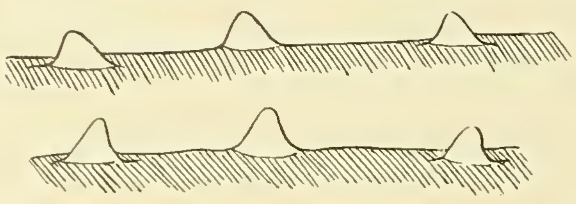

Fig. 197. *Stichopathes saccula* sp. n. Spines on opposite sides of the axis; 52 ×.

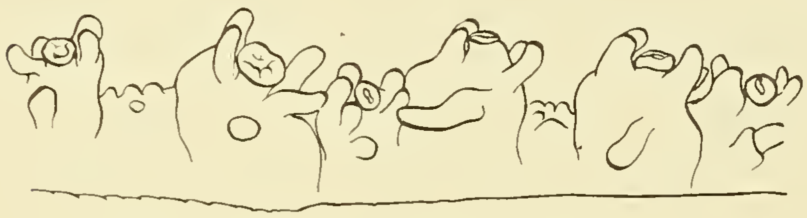

Fig. 198. *Stichopathes saccula* sp. n. Polyps; 7.6 ×.

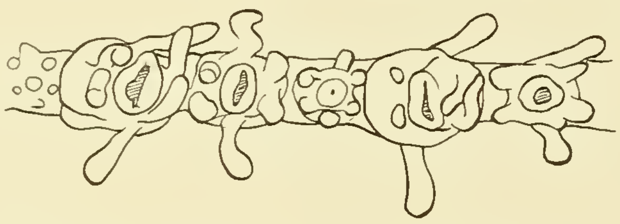

Fig. 199. *Stichopathes saccula* sp. n. Polyps; 7.6 ×.

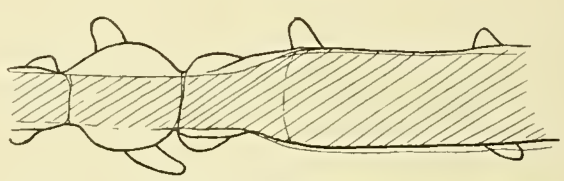

Fig. 200. *Stichopathes saccula* sp. n. Back of the axis at a node; 7.6 ×.

dome above the insertion of the lateral tentacles, but this upper part may also be constricted at the base of the lateral tentacles, so that the mouth gets an outwards-turned lip (fig. 198). The entire cone is slightly distally inclined and it gives the polyps a baggy appearance (fig. 198). The sagittal tentacles are more than 1 mm. long, the lateral ones 0.6 mm.; there is no difference in length between the proximal and distal lateral tentacles. There are many young polyps inserted between the adult ones, but in an irregular manner; part of the colony shows the following mode of alternation (y = young; a = adult): $2\,a - y - a - y - 2\,a - y - 2\,a - y - a - y - 2\,a - y - a - y - a - y - 3\,a - y - a - y - 3\,a -$ etc.

Diagnosis:

Colony: irregularly curved; regularly tapering with, on some places, a swift diminuition of the diameter to an extent of a few hundred μ.

Spines: upright, blunt, conical; rarely distally inclined. Smooth or slightly granulated. Length 75—100 μ, with only a very slight difference on opposite sides of the axis. Mutual distance 450 μ. Number of longitudinal rows 8—11.

Polyps: large, prominent, bag-shaped through the large oral cone, which

has a sagittally elongated or rounded mouth. Lateral tentacles equal in length (0.6 mm.); sagittal tentacles 1 mm., inserted at a much lower level. Interpolypar distance 2 mm. The oral cone may be constricted at the base of the lateral tentacles.

7. *Stichopathes ceylonensis* T. & S.

Stichopathes ceylonensis T. & S. THOMSON & SIMPSON, On the Antipatharia (Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar. Suppl. Rep. 25, p. 93—106).

Stat. 267. 5° 54′ S., 132° 56′.7 E. Arafura-sea. 984 M. Grey mud. 1 spec.

The height of this colony is 10 cm., but the stem is 20 cm., measured along the axis. The basal plate is of an irregular shape, with some wartlike knobs, probably caused by the irregularities of the underground. The first 4 cm. are curved; they are succeeded by three fourth coil of a sinistrorsal spiral, with a diameter of 1.5 cm. Then again a curved part of 3.5 cm. comes in and the rest is 1.5 coils of a sinistrorsal spiral with a diameter of 2 cm., and a distance of 2 cm. between the coils. The basal diameter of the stem is 800 μ and gradually diminishes towards the blunt top, which has a diameter of 300 μ even at a distance of 4 mm. from the top. The spines (fig. 201) are arranged in 3(—4) longitudinal rows, which alternate in a straight or slightly slanting quincunx (fig. 201). Their mutual distance is 750—800 μ at the base of the colony, and increases untill 900 μ, even at a rather small distance from the basal part. The spines are blunt and triangular (fig. 201) with their distal side almost at right angles with the axis; double-topped spines may be found occasionally. The length of the spines is 120—150 μ on the non-polyp-bearing side of the axis. At the base of the colony the spines are rarely in an undamaged condition; their length is here ± 100 μ. The surface of the spines is smooth and their concentric layers are very conspicuous (fig. 201). The polyps (fig. 202) are arranged in a single series with an interpolypar distance of more than 2 mm. The sagittal tentacles are 1.5 mm. long; the lateral ones 1 mm.; the sagittal ones are inserted at a slightly lower level than the lateral tentacles. The oral cone is dome-shaped, somewhat oval with a largest diameter of 0.6 mm. (in the sagittal direction!). The mouth is very much sagittally elongated, with a greatest diameter of 0.2 mm. Young polyps occur between the adult ones: the cross-grooves between the polyps and the longitudinal groove along the back of the axis are clearly visible. The tentacles are directed towards every side, leaving the mouth uncovered (fig. 202 *b*), or they are crowded into a distally directed group, covering the oral cone (fig. 202 *a*). There is no difference in length between the distal and proximal lateral tentacles. — I have thought about a possible identification of this specimen with *Stichopathes abyssicola* R. but the type of polyp is too unlike each other, while the spines are also too different to permit a

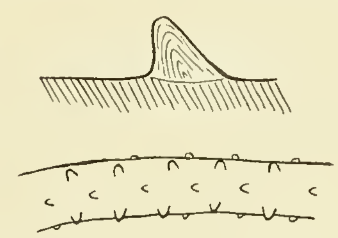

Fig. 201. *Stichopathes ceylonensis* T. & S. Spine (52 ×) and arrangement of the spines (7.6 ×).

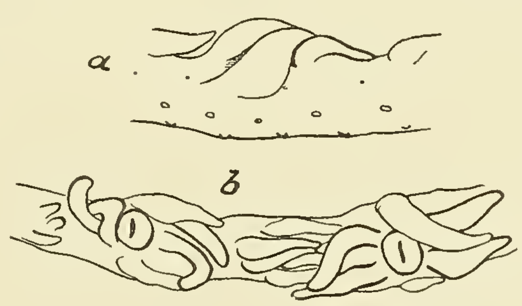

Fig. 202. *Stichopathes ceylonensis* T. & S. Polyps: *a* profile; *b* oral view; *a*, *b* 7.6 ×.

combination of these species, without having more extensive material, which might give transitions. Although THOMSON's & SIMPSON's description of their *Stichopathes ceylonensis* is rather vague and especially the polypar data are far from characteristic, I have identified the Siboga-specimen with this species. The partly spiral stem, the blunt apex, the gradually diminishing diameter, the shape and the dimensions of the spines, their number of longitudinal rows is almost the same in both specimens.

Diagnosis:

COLONY: gradually tapering, partly straight or curved, and partly a sinistrorsal spiral, with a rather blunt apex.

SPINES: blunt, triangular, laterally compressed; 100—150 μ long; mutual distance 750—900 μ; 3—4 longitudinal rows. Smooth surface; distal side at right angles with the axis.

POLYPS: interpolypar distance 2 mm.; sagittal tentacles 1.5 mm., lateral ones subequal: 1 mm. Sagittally elongated, oval, domeshaped oral cone with sagittally elongated mouth.

2nd Subgenus *Eucirripathes* n. n.

CRITICAL REVIEW OF THE KNOWN SPECIES.

The number of species, appertaining with certainty to *Cirripathes* Br. was not very large, before the publication of my "Bijdragen tot de kennis van het genus *Cirripathes*", while there were a number of species besides, which for more or less valid reasons were joined to the same genus, although their polyps were unknown. The following list gives a review of these species, together with a short diagnosis:

Cirripathes propinqua Brook. COLONY: straight or curved, but not into a spiral; subequal diameter (according to DANA: with nodes in the axis); SPINES: short, thick, conical, at right angles with the axis, different in length on opposite sides of the axis; 14—16 irregular longitudinal rows; POLYPS: dark, rounded, prominent, diameter 1.5 mm., 5 polyps to 1 cm., 1.7 mm. high; high oral cone with basal constriction; mouth with 10 folds; tentacles short and thick, lying around the mouth; polyps placed in a steep spiral.

Cirripathes anguina Dana. COLONY: straight or curved or twisted; distinct nodes in the axis; SPINES: conical, crowded, distally inclined, subequal in length at every side of the axis; irregularly distributed, sometimes in verticils (acc. to COOPER: 6—7 longitudinal rows, spirally round the axis); POLYPS (dried): ± 4 to 1 cm.; no oral cone; (acc. to COOPER: in irregular spirals around the axis).

Cirripathes spiralis (Linn.) Blainv. non Pourtalès. COLONY: rather regular dextrorsal spiral; SPINES: conical, shorter on the inside of the spiral-coils, distributed in sinistrorsal spirals; POLYPS (dried): no details are known.

Cirripathes gardineri Forster-Cooper. COLONY: sinuous with rough annular joints at rare intervals; SPINES: irregularly distributed, blunt, conical with here and there a tendency to be knobbed at the end; a few, exceedingly small, triangular secondary spines are scattered

irregularly among the larger ones; Polyps: straw yellow, large, 3 mm. high, 2 mm. oral diameter (variable), all round the corallum, quite irregularly distributed; two lateral tentacles are a little longer.

Cirripathes? *pancispina* Brook. Colony: scarcely tapering, lightbrown, with the appearance of mica; Spines: short, rather far apart, 4 longitudinal rows (in a steep spiral), conical, blunt apex which is rough; at right angles with the axis or slightly distally inclined; Polyps: unknown.

Cirripathes? *flagellum* Brook. Colony: slightly curved, non-spiral, habitus like *C. anguina* and *propinqua*; Spines: long ones, which are conical, acute, with papillose apex, arranged in incomplete spirals, and small ones, which are slender, in irregular rows between the larger ones, half as long as the longer spines; Polyps: unknown.

Cirripathes? *diversa* Brook. Colony: the same habitus as *C. spiralis*; Spines: long ones, which are blunt and arranged in 12 longitudinal rows, wound in dextrorsal spirals round the axis, and short ones, which are numerous, triangular, short and acute; Polyps: unknown.

None of these species is collected by the Challenger itself; the specimens, described by Brook, came from the collections in the British Museum. *Cirripathes propinqua* was the only species, the polyps of which were preserved in spirits and could be searched by Brook. Forster-Cooper makes mention of specimens of *Cirr.*? *diversa* Br. and *Cirr. anguina* Dana, while these specimens and those of *Cirr. gardineri* came from the material collected by Gardiner in the Mald. and Lacc.-Archip. At following expeditions *Cirripathes*-species were very rarely collected; only Thomson and Simpson described a species which, although the polyps are absent, is reckoned by them to *Cirripathes*. This specimen, described as *Cirr.*? sp. n.? is entirely like *Stichopathes lütkeni* Brook in the shape of the colony and the spines. Forster-Cooper's new species *Cirr. gardineri* is only incompletely described. So in all there are 4 undoubted species and 4 dubious ones. But the former are not all of them unassailable. Brook himself granted that these species are very much like each other; after having put aside the specimens with a spiral stem as *Cirripathes spiralis* (Linn.) Blainv., he divided the other specimens, basing his opinion on the characters of the spines and the diameter of the axis, in *Cirr. anguina* Dana and *Cirr. propinqua* Brook (only one single specimen!). However the material of the *Stichopathes*-species, described by me, has shown the very great variability of one and the same species, especially in regard to the shape of the colony and the characters of the spines, often to such a degree as to make it very dubious if these characters may be used as specific characters of first order. Not only the shape of the spines and their dimensions are so very variable, but also the number of longitudinal rows, the spirals which they form, the unequal length on opposite sides of the axis, etc., even with one and the same specimen. — The only specimen of *Cirr. propinqua* Br. differs from *Cirr. anguina* Dana in the spines, which are shorter, more numerous, unequal on opposite sides of the axis, and arranged in irregular longitudinal rows; but these are differences, which may be found within the range of the variability of *Cirr. anguina* Dana, while besides the nodes in the axis, which are observed in *Cirr. anguina* Dana, and which are so-called absent in *Cirr. propinqua* Br., certainly are present in the latter species, according to Dana. So I am much inclined to unite both species. — Besides it is an open question whether the spiral shape of the colony is a settling argument to

form the species *C. spiralis*, since the polyps are only known in a very desultory manner, with one single exception all of them only in a dried condition and in obsolete figures, and the shape of the colony in itself is not constant enough to be made use off, without further characteristics being known as is demonstrated by the Siboga-material.

Among the other, dubious, *Cirripathes*-species *Cirr.? flagellum* Brook differs again only in characters of the spines from *Cirr. anguina* Dana and *Cirr. propinqua* Brook, while *Cirr.? diversa* Brook differs also in spine-characters from *Cirr. spiralis* (Linn.) Blainv. We conclude from Forster-Cooper's publication that the difference between *Cirr. spiralis* (Linn.) Blainv. and *Cirr. diversa* Br. is not very great. The latter species has also smaller spines distributed between the larger spines. The number of longitudinal rows of spines is according to Cooper's figure less than according to his description and is better in accordance with the tabels, made by me for *Cirr. spiralis*; I refer to my discussion of the Siboga-material of this species for its further identification. — Only *Cirr. paucispina* is not immediately to be identified with one of the discussed species, although it may be remarked that the colour of the axis gives no absolute certainty, especially since the polyps are entirely unknown. — Thomson's and Simpson's *Cirr.?* sp. n.? is too incompletely figured and described as to permit a positive conclusion.

Cirr. gardineri F. C. is not unlike *Cirr. anguina* Dana in general appearance, according to this author. The polyps are a good deal larger, but not if we compare the Siboga-material with them, and the spines are of a slightly different shape, but also this difference is of no great value. The colour is also different, but this is unimportant, especially in spirit-specimens, and Forster-Cooper rightly remarks that this is a point of very doubtful specific value. After all the difference is in secondary spines especially (which term is not very suitable, since there is no question about the smaller spines being "secondary"), present in *Cirr. gardineri* and absent in *Cirr. anguina* Dana. In the description of *Cirr. gardineri* we find that there are a few exceedingly small triangular secondary spines between the larger ones; I do not think it desirable, with so very great a likeness in all possible qualities (cf. Forster-Cooper's figures of the polyps with the polyps figured by me in the description of the Siboga-specimens of *Cirr. anguina* Dana) to keep both species apart, mainly basing on a few small spines, which, as is demonstrated by *Cirr. spiralis* Blainv. and *Cirr. diversa* Br. sometimes may be found between the larger spines. In my opinion *Cirr. gardineri* F.-C. ought to be united with *Cirr. anguina* Dana. I retain the following species:

1. *Eucirripathes anguina* (Dana) emend., which contains also: *Cirripathes propinqua* Brook, *Cirr. flagellum* Brook and *Cirr. gardineri* Forster-Cooper, and the diagnosis of which is, for the present, as follows:

Colony: straight, or curved, or twisted; subequal diameter or with distinct nodes in the axis. No spiral.

Spines: conical, thick, at right angles with the axis or slightly distally inclined; sometimes of unequal length on opposite sides of the axis; 14—16 longitudinal rows.

Polyps: arranged in a steep spiral, dark, rounded, prominent, diameter 1.5 mm.; 5 polyps to 1 cm.; 1.7 mm. high; high oral cone, with a basal constriction; mouth with folds; tentacles short and thick with basal swelling.

2. *Eucirripathes spiralis* (Linn.) Blainv., which contains also *Cirr. diversa* Brook, and the diagnosis of which is for the present:

Colony: rather regular dextrorsal spiral.

Spines: conical, unequal length on opposite sides of the axis or longer and shorter spines pell mell; 12 longitudinal rows.

Polyps: dried, and so very incompletely known.

3. *Eucirripathes? paucispina* Brook.

Colony: scarcely tapering, lightbrown.

Spines: short, conical, blunt, rough apex, at right angles with the axis or slightly distally inclined, rather far apart; 4 longitudinal rows.

Polyps: unknown.

4. *Eucirripathes?* n. sp.? T. & S.

Colony: tapering; base curved; higher part: spirals.

Spines: papillose; shorter and thicker on the basal part of the colony; irregularly distributed on the base of the colony; at the top in verticils; mutual distance 1.5—2 × the length of the spines.

Polyps: unknown.

The **Siboga-specimens** contain the following species:

1. *Eucirripathes anguina* (Dana) emend. (Pl. VIII, figs. 3, 4, 7)[1].

Cirripathes anguina Dana. Dana, Zooph., p. 577, pl. LVI, fig. 1; Brook, Antipatharia, Chall. Rep., p. 84; Forster-Cooper, Antipatharia (Gardiner, Fauna, etc.), p. 793, pl. LXV, fig. 2; van Pesch, Bijdragen t. d. kennis v. h. genus Cirripathes, p. 9, etc.; Cooper, Antipatharia, (Percy Sladen Trust Exp.), p. 308, pl. 41, fig. 3.
Cirripathes propinqua Br. Brook, Antipatharia, Chall. Rep. p. 82, pl. X, figs. 9–13, pl. XII, fig. 14.
Palmijuncus striatus. Rumphius, Herb. Amb. Lib. XII, c. 3.
non *Palmijuncus anguinus*. Rumphius, Herb. Amb. Lib. XII, c. 3.
Antipathes spec. Gray, Proc. Zool. Soc. London 1857, p. 114, pl. VI.
Cirripathes gardineri F.-C. Forster-Cooper, Antipatharia (Gardiner, Fauna etc.), p. 793, 794, pl. LXV, figs. 3 and 3*a*.

Stat. 213. Anchorage off Saleyer. Up to 36 M. Mud and mud with sand. 7 spec.

One of these 7 specimens is a fragment of 9 cm. long, preserved in spirits so that the polyps can be examined, while the other 6 specimens are in a dried condition. This fragment has a diameter of 3.6 mm., diminishing to 2.95 mm. regularly, except for a swift diminuition, where the axis makes an obtuse angle. The spines are arranged in 12—13 longitudinal rows, which may be slightly curved, while they often alternate in a quincunx. The mutual distance of the

1) Cf. the supplement on p. 177.

spines is 450 μ, which value is variable. The shape (fig. 203) is thick and cylindrical with a conical blunt apex; usually they are at right angles with the axis, but they may be also somewhat distally inclined; their surface is granulated. The average length is 180 μ and there is no very conspicuous difference in length on opposite sides of the axis. The polyps (figs. 204, 205 and Pl. VIII fig. 7) are situated in a great number at every side of the axis, except for a tract on one side of the axis, somewhat broader than the normal distance between the polyps. They are arranged in longitudinal rows, which now and then become irregular. The interpolypar distance varies rather much and is max. 2.2 mm.; however often two polyps are so near each other as to touch their mutual bases. Some younger polyps are inserted between the adult polyps in an irregular way. The sagittal tentacles are 2.3 mm. long, the lateral ones 1.7 mm. and equal in length. Usually they are upright on the axis, but they may also be directed distally in a group; they are never lying against the axis, so that the polyps may always be seen separately. The sagittal tentacles are inserted at a greater distance from the oral cone than the lateral ones. The oral cone is very high with a basal constriction and a flat upper side, which has a sagittally elongated slit-like mouth. The diameter of the oral cone is 0.5 mm., its height is 0.5—0.6 mm. — Between the polyps the cross-grooves in the coenenchyma may be clearly seen together with a great number of very fine grooves or canals, which alternately converge and diverge, since they surround the base of the polyp (fig. 205 at both ends of the fragment). With a view upon the remarkable qualities of the stem I shall describe the dried specimens separately:

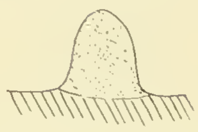

Fig. 203. *Eucirripathes anguina* (Dana) em. Spine; 58.5 ×.

Fig. 204. *Eucirripathes anguina* (Dana) em. Polyp: one lateral tentacle is omitted and part of a sagittal tentacle to show the shape of the oral cone; 8.5 ×.

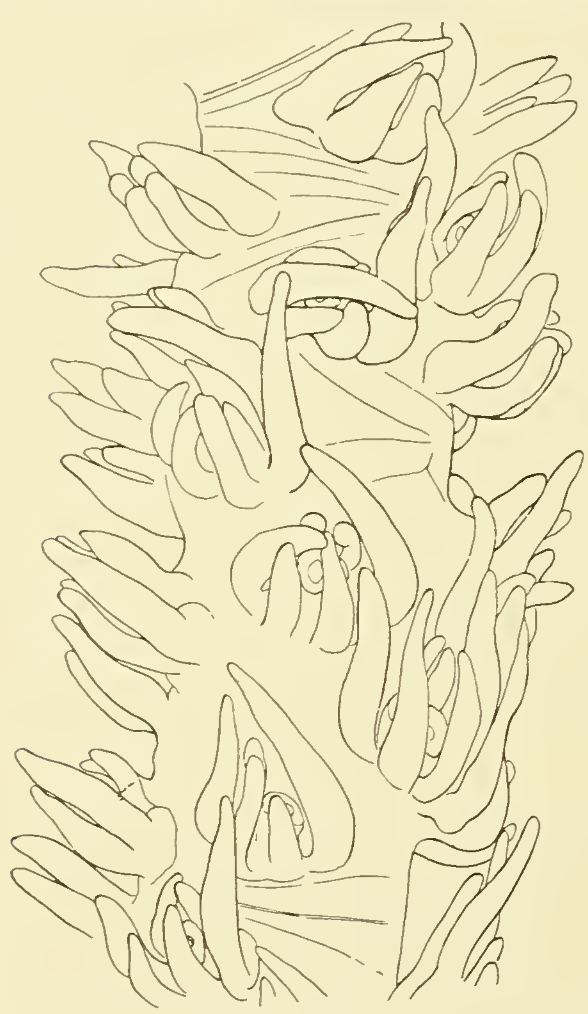

Fig. 205. *Eucirripathes anguina* (Dana) em. Polyps; 8.5 ×.

I. 0.5 m. long; diameter 3.5—4 mm., with swellings at irregular places; the entire colony is irregularly sinuous, without a trace of a spiral, but the principal direction is straight. Most of the curves are accompanied by angular bends of the axis. The colony-top, which is complete, as is demonstrated by the coenenchyma, which covers it undamaged, has a very typical shape (Pl. VIII, fig. 4): its diameter increases swiftly to 6 mm., while the entire top is covered with little knobs. — On two places the colony has a kind of branch; one of them is a conical knob of only 3 mm. high; the other one, 3 dm. further on, is an unmistakable branch of 1.5 cm. long, with an irregular diameter of 2.5—3 mm. (Pl. VIII, fig. 3; the attachment of the branch begins at the line $a-a$). This branch, which is also very sinuous and curved, lies against the stem at a

very small distance. The entire branch is covered with polyps and coenenchyma which is whole, so that the top of the branch is clearly undamaged. This top is conical and of the same shape as the other branch and the top of the stem itself! — The colony is entirely covered with polyps, darkbrown, while the coenenchyma is greyish. The polyps are inserted on all sides of the axis, but usually they are on one side of the axis more crowded than on the opposite side. Where they are most densely crowded, there are, on one aspect of the stem, ± 15 polyps to a distance of 1 cm. They are very prominent and so clearly visible; height and diameter: ± 1 mm. They are not inserted in regular longitudinal rows, while their mutual distance is also irregular, 2 mm. on an average but it may be exceedingly more or less. — The coenenchyma has many cracks and fissures, apparently the dried grooves, so that it is obvious that these grooves are thinner parts of the coenenchyma, and so places of minor resistance. — The polyps have the same structure as in the spirit-specimen, making allowance for the dried condition.

II. 1.25 m. long; two rather straight parts, which are connected at an angle of ± 120°; basal diameter 7 mm., top-diameter 4 mm. Shaped like I, except that the angularity of the curves is absent. Natural base as well as natural top and branches are absent. Polyps less prominent, but otherwise like the polyps of I.

III. 75 cm. long; basal diameter 5 mm., diameter near the top 4 mm. Shaped like I and II. Base attached to a piece of coral. The top shows an open S-shaped loop; coenenchyma and polyps like I and II. At a short distance from the end the complete top shows an increase of diameter to almost 5 mm. before diminishing towards the conical top, which is shaped as in I, but the coenenchyma shows a small scar so that the top may have borne a filiform extension. The last 20 cm. of the colony have irregular swellings of the axis, but no branches.

IV. 85 cm. long; basal diameter 3.5 mm.; diameter near the top 3 mm.; top is in every respect (also the scar) like that of III. Shape of stem is like I; part of the axis has an indication of a steep spiral. On some places local swellings of the axis. Polyps, etc. ditto as in former specimens.

V. 2 m. long; basal diameter 5 mm.; diameter on 20 cm. distance of the top 3 mm. Polyps and shape of the colony like I; sporadical parts of a spiral. Axis with nodes, especially the last 20 cm., where the diameter increases towards the top, which is shaped as in the other specimens, with a max. diameter of 6 mm. On a height of 75 cm., on a small mutual distance, there are found two knobs, respectively 4 and 5 mm. high above the axis. They are completely covered with coenenchyma and they are shaped like the normal top of these colonies so that they may be considered as branches.

VI. 2.5 m. long (base is snapped off); basal diameter 5 mm. increasing swiftly to 6.5 mm.; the top is broken at a diameter of 3.5 mm. Habitus ditto as of the other specimens but the curves are less pronounced; sometimes wart-like swellings on the axis. The polyps are not very conspicuous.

VII. 85 cm. long; basal diameter 7.5 mm.; the top is broken at a diameter of 4 mm. The basal plate follows all the irregularities of the underground, here a piece of coral. Polyps

and coenenchyma ditto as in the other specimens, shape of the colony also, but the undulations in the toppart of the colony are small and scanty. No swellings of the axis; no branches.

The spines of all the described specimens are very numerous; they are at right angles with the axis as in *Eucirripathes propinqua* (Brook), or slightly distally inclined as in *Eucirripathes anguina* (Dana), or the distal side is at least more upright than the proximal side. On the thinner parts of the axis there are at least 12 longitudinal rows, which may be more or less regular. Sometimes the distribution is entirely irregular. Often the spines are of a very unequal length on opposite sides of the axis. Their shape is blunt and conical when they are at right angles with the axis, but more acute when they are distally inclined; it is very like the figures, given by Brook for *Eucirripathes anguina* and *propinqua*.

On comparing all the described specimens, there is left no doubt about their appertaining to *Eucirripathes anguina*, considering the typical shape of the axis, which is always irregularly twisted snake-like, without spiral coils, except for some spiral-like parts of spec. V. The shape of the spines also agrees very well with those of *Eucirr. anguina* and *propinqua*. The characteristic shape of the colony-top is very remarkable, at first increasing in diameter, afterwards tapering in a conical shape. — The branches, which are certainly only very short, but which often or always have the typical shape of the colony-top, are too long to be considered as mere swellings of the axis, while, on the other hand, their influence on the shape of the colony is not great enough to place this species among the branched genera. The character of *Eucirripathes*, viz. the multiserial arrangement of the polyps etc., is too obvious to be ignored. — As to the polyps, their dimensions are somewhat unlike those of *Eucirripathes propinqua* (Brook), while the number of polyps to 1 cm. of the axis is considerably greater than according to Brook. But the position of the tentacles against the oral cone, and the entire habitus of the polyps is very like those figured by Brook. — The diagnosis should be:

Colony: unbranched, sometimes bearing very short branches; changing diameter; increasing diameter at the top which ends conical and blunt; irregularly sinuous and twisted; rarely part of a steep spiral is indicated.

Spines: blunt, conical, at right angles with the axis or, with the smaller ones, more acute and distally inclined; rough surface; 12—14 longitudinal rows; average length 180 μ; mutual distance is about 450 μ.

Polyps: numerous, conspicuous, in irregular longitudinal rows on every side of the axis, except for a narrow streak on one side; interpolypar distance max. 2 mm.; sagittal tentacles 2.3 mm., lateral ones 1.7 mm., upright on the axis or in a distally directed group; high oral cone with basal constriction; sagittally elongated mouth; numerous cross-grooves between the polyps.

In his Herbarium Amboinense Rumphius described some *Eucirripathes*-specimens, which are called "Tali-aros" and "Rottang laut" and which Rumphius named *Accarbarium unicaule* or *Palmijuncus marinus*; he made a distinction between three species: *Palm. vulgaris*, *Palm. striatus* and *Palm. anguinus*. Brook has placed the latter one, in imitation of Dana, among *Eucirr. anguina* (Dana), to which it does not belong at all, since the axis is wound in a spiral with small diameters of the coils, as is not only described by Rumphius, but also very clearly figured

by him. So this *Palmijuncus anguinus* appertains to *Eucirripathes spiralis* (Blainv.) v. P., with which PALLAS has very rightly combined it. Both the other species, also figured by RUMPHIUS, are ignored by BROOK, although especially these ones are very like *Eucirr. anguina* in the typical, sinuous axis. Especially for *Palmijuncus striatus* there can be no doubt about this likeness; however for *Palm. vulgaris* there is room for doubt since RUMPHIUS' description is somewhat vague, and only the basal part of the colony is figured by him. This basal part is very like the colonies of *Eucirr. anguina* but the toppart, according to RUMPHIUS' description is: "een dunne draad met veel bochten en cirkels". This is entirely in disaccord with the top of *Eucirr. anguina* Dana and for this reason (i. a.!) I prefer to identify *Palmijuncus vulgaris* with *Eucirripathes Rumphii* v. Pesch rather than with *Eucirripathes anguina* (Dana).

The top of DANA's specimen of *Eucirr. anguina* (Dana), is, according to DANA's figure of the colony, not of the typical shape of the Siboga-specimens and tapers swiftly but gradually. — The specimen, figured by GRAY in Proc. Zool. Soc. 1856—57 are remarkably like the Siboga-specimens. The figured colony is entirely like the irregularly sinuous colonies of *Eucirr. anguina* (Dana), while the dried "bark" figured by GRAY is in every respect similar to the dried parts of the Siboga-specimens. Without any doubt GRAY's species is to be identified with *Eucirr. anguina* (Dana). *Cirr. gardineri* Forster-Cooper is united with this species on grounds which are fully given in the critical review of formerly described species.

Former habitat: DANA, Fiji 5 ft.; KLUNZINGER, Red Sea; STEPHENS, Seychelles; BOLSIUS, Billiton; ONDAATJE, Ceylon; Challenger: N. Guinea, Cape Moresby 4 fm.; RUMPHIUS, Ambon (in shallow, swift currents); FORSTER-COOPER, Suvadiva atoll 40 ft., S. Nilanda 30 ft.; Seychelles F. 9, 37 fathoms.

2. *Eucirripathes nana* v. Pesch.

Cirripathes nana v. P. VAN PESCH, Bijdr. tot de kennis van het genus Cirripathes, p. 14 etc.

Stat. 133. Salibabu-island. Up to 36 M. Mud and hard sand. 1 spec.

This complete colony is 5.5 cm. high, with a length of 9 cm. measured along the axis. The first half is irregularly curved; the upper half is a coil of a sinistrorsal spiral. The basal diameter of the axis of 360 μ increases to 405 μ at a height of 3 cm.; afterwards the diameter remains subequal, to diminish, scarcely at a distance of 1 cm. from the top, swiftly to the slightly damaged blunt apex (diameter 225 μ). The basal plate is darkbrown with a lightbrown border and an irregularly oval outline; the axial canal is at the top only 13 μ on diameter.

The base of the colony is almost entirely smooth; on a little higher level the spines are well developed; their distribution is irregular here. They are conical, with a smooth surface, and 75 μ long. This length increases gradually, while a different length of the spines on opposite sides of the axis puts in appearance and the distribution becomes more regular. The longer spines (135 μ) are blunt conical, the smaller ones (80 μ) are acute conical (fig. 206). The top of the spine is often slightly granulated. The mutual distance is from 420 to 490 μ, so that the quincunx, which sometimes may be observed, is ever and again shifted. There are 5 longitudinal rows, but usually this regularity is rather small, also in the higher parts of the

colony. — With the exception of the first 3 cm. the entire colony is covered with polyps. Usually they are inserted in a single series, but this series is very irregular (fig. 207), so that

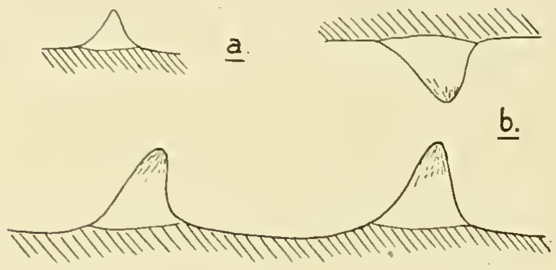

Fig. 206. *Eucirripathes nana* v. Pesch. Spines: *a* on the base of the colony; *b* on a higher part; *a*, *b* 58.5 ×.

Fig. 207. *Eucirripathes nana* v. Pesch. Polyps; 12.5 ×.

it approaches the *Eucirripathes*-type. The young polyps, distributed between the adult ones, are sometimes so very much laterally shifted as to lie next to the adult polyp on the axis, instead of behind each other. For this reason I consider this specimen as a young colony of *Eucirripathes*; the microscopical anatomy supports this opinion. — On some parts of the colony

Fig. 208. *Eucirripathes nana* v. Pesch. Polyps on the top-part of the colony: 12.5 ×.

the tentacles are contracted, knob-shaped (fig. 208) and very much wrinkled; their apex is brown and the base of the tentacle is lighter coloured. The mouth is a transversally elongated slit; the sagittal tentacles are 0.75 mm. long, the lateral ones 0.6 mm. or subequal to the sagittal tentacles. The height of the oral cone is 0.4 mm.; its diameter 0.45 mm. The interpolypar distance is 0.9 mm. Some polyps have their proximal lateral tentacles more developed than their distal lateral ones. I can see no cross-grooves between the polyps.

Diagnosis:

Colony: unbranched, sinuous or partly spiral, without swellings of the axis; blunt apex with a very thin axial canal; diameter increases at first and is for the rest subequal.

Spines: acute or blunt conical with slightly granulated top; different length on opposite sides of the axis: 135 μ and 80 μ; mutual distance ± 455 μ; 5 irregular longitudinal rows; base of the colony smooth.

Polyps: in irregular rows; tentacles long or knobshaped; high oral cone with transversally elongated mouth; sagittal tentacles 0.75 mm. long, lateral ones 0.6—0.75 mm.; sometimes predominating proximal lateral tentacles. — Interpolypar distance 0.9 mm.

3. *Eucirripathes translucens* v. Pesch.

Cirripathes translucens v. P. van Pesch. Bijdr. tot de kennis v. h. genus Cirripathes, p. 15.

Stat. 274. 5° 28'.2 S., 134° 53'.9 E. Near Aru-islands. 57 M. Sand and shells, stones. 1 spec.

This colony is attached to a stone by means of a large, irregular basal plate, black and following every irregularity of the underground. — The length is 27 cm.; the axis is irregularly curved, except the first 9 cm. which are straight and upright. The basal diameter of

2.5 mm. remains subequal till at a distance of 4 cm. from the top, where a swift diminuition of the diameter takes place from 2.5 mm. to 0.75 mm. Afterwards the axis gradually tapers towards the almost complete top. The spines (fig. 209) are very blunt and conical, at right angles with the axis and of a very heavy built. They are 300 μ and 45 μ on opposite sides

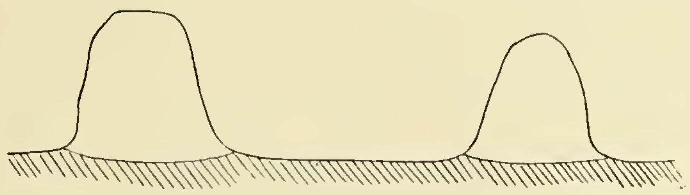

Fig. 209. *Eucirripathes translucens* v. Pesch. Spines on the basal half of the colony; 58.5 ×.

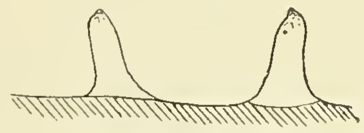

Fig. 210. *Eucirripathes translucens* v. Pesch. Spines on the toppart of the colony (not out of the same row); 58.5 ×.

of the axis; sometimes the shortest spines have almost disappeared so that one side of the axis is almost smooth. Their mutual distance is 825—900 μ; the ± 9 longitudinal rows alternate in a straight quincunx; the surface of the darkbrown spines is smooth. The thinner part of the axis has spines (fig. 210), which are more slender and not always at right angles with the axis. Their surface is slightly granulated at the top. Here their distribution is not very regular. The polyps (figs. 211 and 212) are not everywhere in a good state of preservation. On the basal part there are only a few, which are damaged besides; the top-part is entirely covered with polyps. The coenenchyma shows numerous cross-grooves. The *Eucirripathes*-character is very obvious; on the top-part at least 2 rows of polyps may be distinguished; the short-spined side of the axis is entirely left open by the polyps. — The tentacles are lying against each other, covering the oral cone and the mouth, and they are distally directed in a group; they are very transparent. The sagittal tentacles, 1.4 mm. long, are situated at a greater distance from the oral cone than the lateral ones, which are somewhat shorter than or of equal length as the sagittal tentacles. The very great transparency of the polyps makes it difficult to distinguish the parts of the polyps from one another. The oral cone is invisible, like the mouth. The microscopical examination shows an oral cone with a sagittally elongated mouth. The interpolypar distance is ± 1.5 mm. Young polyps are sown among the adult ones. On the higher part of the colony (fig. 211) the polyps are arranged irregularly, but always on one side of the axis; there are no longitudinal rows to be seen, while the interpolypar distance is very variable. On a higher part many smaller, young polyps are found. The coenenchyma is very thin, so that it is perforated by the spines.

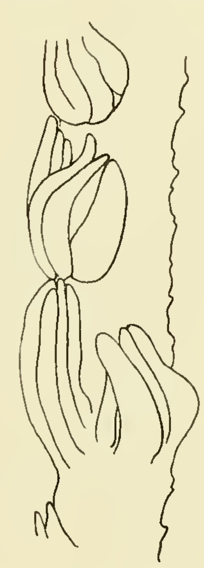

Fig. 211. *Eucirripathes translucens* v. Pesch. Polyps on the top-part of the colony, with spines and cross-grooves omitted; 12.5 ×.

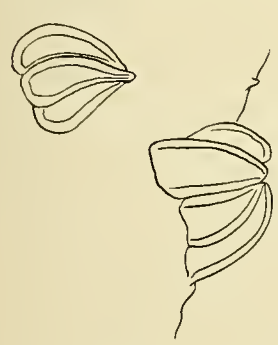

Fig. 212. *Eucirripathes translucens* v. Pesch. Polyps on the base of the colony; 8.5 ×.

Diagnosis:

Colony: irregularly curved, with swift diminuitions of the diameter; unbranched.

Spines: blunt, conical, sometimes with sligthly granulated top; different length on opposite sides of the axis: 300 μ and 45 μ. Mutual distance ± 860 μ; 9 regular longitudinal rows.

Polyps: very transparent; arranged in some longitudinal rows, or irregularly distributed; they leave one side of the stem entirely free; hardly visible oral cone with sagittally elongated mouth; proximal tentacles somewhat longer than the distal ones; sagittal tentacles 1.4 mm., lateral ones 1.4 mm. or somewhat less. Interpolypar distance 1.5 mm.; tentacles lying against the oral cone, and distally inclined.

4. *Eucirripathes contorta* v. Pesch. (Pl. VIII, fig. 9).

Cirripathes contorta v. P. van Pesch, Bijdr. tot de kennis van het genus Cirripathes, p. 17.

Stat. 240. Banda. From 9—45 M. Black sand, coral. 2 spec.

Both specimens are very much contorted and twisted and wound into a loose ball. The length of the largest specimen can be estimated on 1.5 m., and of the smaller specimen on 65 cm. But by the convoluted form of the colonies they can easily be put into a bottle of 20 cm. height and 16 cm. diameter. The diameter of the smaller colony is nowhere more than 9 cm. Only the top of the largest specimen is wound into three coils of a spiral with diameters, diminishing from 2.5 to 0.75 cm. The base of this colony bears part of a small basal plate. The basal diameter of 2.25 mm. increases rather swiftly to 3.5 mm. With small oscillations this diameter diminishes at first slowly, later on more swiftly. The top is slender and snapped off at a diameter of 0.5 mm. The entire colony is covered with polyps, except 1.75 dm. of the base. The spines (fig. 213) are arranged in longitudinal rows, which sometimes are wound in a very steep spiral around the axis. Rarely the regular rows are somewhat shifted; usually they alternate in a quincunx. There are ± 10 longitudinal rows on the middle of the smaller colony, and 14—15 on the middle of the larger specimen while its top has already 14 rows. The length of the spines (on the toppart of the larger spec.) is 155 μ and 110 μ on opposite sides of the axis; the smaller spines are to be found at the concave side of the curves of the axis. The mutual distance is ± 525 μ. The smaller spines are somewhat more acute than the longer ones; both their sides are concave, while with the longer spines the proximal side is slightly convex. The surface of the spines is granulated, especially on the top and the proximal side of the spines. The base is elongated.

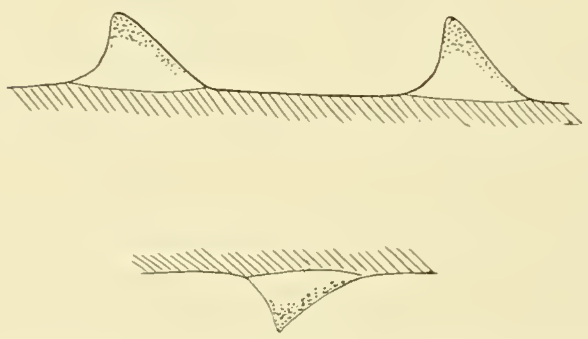

Fig. 213. *Eucirripathes contorta* v. Pesch. Spines on the toppart of the colony; 58.5 ×.

The polyps (figs. 214, 215) are beautifully preservated on both colonies. They are greyish to light yellow brown in colour. The coenenchyma is thick; the polyps are distributed round the axis, although usually one side of the axis is almost free. They are not arranged in a special number of longitudinal rows, although sometimes a few polyps may form a short longitudinal row. The polyps are very prominent and conspicuous; even the ultimate toppart of

the colony shows no uniserial arrangement of the polyps (fig. 215). To 1 cm. of the axis ± 10—12 polyps may be found; many young polyps occur between the adult ones. The sagittal tentacles are 1.75 mm. long, the lateral ones 1.35 mm. The cylindrical oral cone, with a flat upper side, is 0.4 mm. high, with a diameter of 0.4 mm. The borders of the sagittally elongated

Fig. 214. *Eucirripathes contorta* v. Pesch. Polyps on the middle part of the smallest colony; 16 ×.

Fig. 215. *Eucirripathes contorta* v. Pesch. Polyps on the top-part of the smallest colony; 16 ×.

slit-like mouth are folded. The sagittal tentacles are inserted at a greater distance from the oral cone than the lateral ones. Some parts of the polyps are rather transparent; the tentacles are transversally striped or wrinkled, perhaps caused by muscular contraction (?) since this species has rather well developed muscles, also in the tentacles. The polyps are separated by broad cross-grooves in the coenenchyma, but next to these there are also numerous finer grooves, much narrower, which diverge and converge alternately as in *Eucirripathes anguina* (Dana), around the base of the polyps. Only a few spines can be seen through the coenenchyma.

Diagnosis:

Colony: irregularly curved and twisted into a loose ball, at first regularly increasing and afterwards diminishing diameter; unbranched; top slender without increase of diameter.

Spines: triangular, blunt or acute, both sides concave (the short spines) or only the distal side (the long spines); 110 μ and 155 μ on opposite sides of

the axis; mutual distance ± 525 μ; arranged in 10—15 longitudinal rows, wound round the axis in very steep spirals; top and proximal side granulated.

POLYPS: leaving one side of the axis usually free; irregularly arranged without longitudinal rows; high cylindrical oral cone with flat upperside and sagittally elongated mouth; tentacles lying against the oral cone, usually distally inclined; sagittal tentacles 1.75 mm.; lateral ones 1.35 mm. Interpolypar distance 3 mm.

5. *Eucirripathes spiralis* (Blainv.) v. Pesch.

Palmijuncus anguinus. RUMPHIUS, Herb. Amb. Lib. XII, cap. 3.
Gorgonia spiralis Linn. LINNAEUS, Syst. nat. ed. X.
Gorgonia abies var. *spiralis* Linn.
Antipathes spiralis Pall. PALLAS, Elenchus Zooph. p. 217; ELLIS & SOLANDER, Zooph. p. 99, pl. 19, figs. 1—6; ESPER, Pflanzenthiere, pt. II, p. 154, Tab. VIII; LAMOUROUX, Polyp. flex., p. 373; Exp. méthod., p. 31, pl. 19, figs. 1—6, non POURTALÈS, Bull. Mus. Comp. Zool., pt. VI, 1880, p. 114, pl. 3, figs. 5, 25, 26.
Cirrhipathes spiralis Bl. BLAINVILLE, Manuel d'Act., p. 512, pl. 88, fig. 2; DANA, Zooph., p. 376; MILNE-EDWARDS, Coralliaires, pt. I, p. 313.
Cirripathes spiralis (Linn.) Blainv. non Pourtalès. BROOK, Antipatharia, Chall. Rep. p. 85, pl. XII, fig. 10; VAN PESCH, Bijdr. tot de kennis van het genus Cirripathes, p. 19 etc.
Cirripathes (?) *diversa* Br. BROOK, Antipatharia, Chall. Rep., p. 87, pl. XII, fig. 12; FORSTER-COOPER, Antipatharia (Gardiner, Fauna etc.). p. 793, pl. LXV, figs. 1, 1*a*.
Stichopathes (?) *lütkeni* Br. BROOK, Antipatharia, Chall. Rep. p. 94, pl. XII, figs. 28, 28*a*.
Stichopathes contorta T. & S. THOMSON & SIMPSON, Notes on the Antipatharia (Ceylon Fish. Rep. etc.), p. 100, fig. 3.
Stichopathes (?) *euoplos* Sch. SCHULTZE, Die Antipatharien der deutsch. Tiefsee-Exp. Valdivia, Bd. III, Lief. II, p. 96, Taf. XIII, fig. 7.

Stat. 156. 0° 29'.2 S., 130° 5'.3 E. Near Waigeu-island. 469 M. Coarse sand and broken shells. 1 spec.
Stat. 164. 1° 42'.5 S., 130° 47'.5 E. Arafura-sea. 32 M. Sand, small stones and shells. 1 spec.
Stat. 274. 5° 28'.2 S., 134° 53'.9 E. Near Aru-islands. 57 M. Sand and shells, stones. 1 spec.
Stat. 305. Solor-strait. 113 M. Stony bottom. 1 spec.
Stat. 310. 8° 30' S., 119° 7'.5 E. Flores-sea. 73 M. Sand with pieces of dead coral. 6 spec.

In view of the rather variable qualities of these specimens and the identification of some other species with this *Eucirripathes*, partly based on this variability, I shall describe the specimens separately.

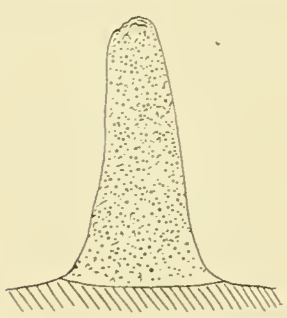

Fig. 216. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spine; 58.5 ×.

The flexible specimen of station 274 lacks the natural base; length 26 cm., curved in a circle, with an indication of a sinistrorsal spiral-coil. The basal diameter is 1 mm., which value gradually diminishes towards the top which is snapped off at a diameter of 0.3 mm. The colony is almost entirely covered with polyps. The spines (fig. 216) are large and project very far through the coenenchyma as well as through the polyps. They are blunt, cylindrical in shape, with a somewhat broadening base. Their length is 530 μ and 225 μ on opposite sides of the axis; the longest ones can be found on the polypbearing side of the axis; mutual distance 675—750 μ. There are ± 8 longitudinal rows, alternating in a straight quincunx. The top of the spines is

knobby, while the rest of the surface is finely granulated. Towards the top of the colony the spines are more slender and somewhat more distally inclined. On the top there are 7 longitudinal rows. The polyps (fig. 217) are arranged in several (even three) longitudinal rows, but they leave one side of the axis completely free. On some parts of the colony the number of polypar rows diminishes to two, or even to one. Young polyps are found between the adult ones. The yellow-grayish coloured polyps are to be discerned by the naked eye as separate polyps. The tentacles are short and knob-shaped; the sagittal ones are inserted at a greater distance from the oral cone than the lateral ones. Usually the low oral cone is distinctly visible, especially with the younger polyps. The oral cone is without longitudinal stripes.

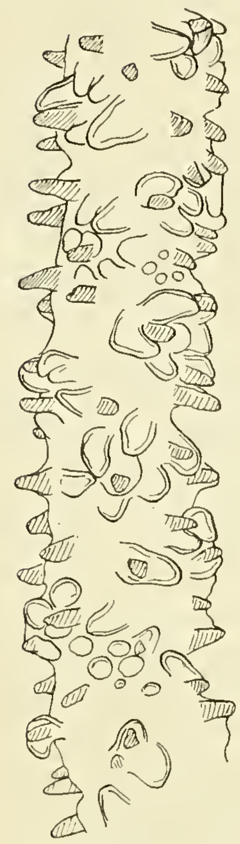

Fig. 217. *Eucirripathes spiralis* (Blainv.) v. Pesch. Part of a colony with three rows of polyps; 16 ×.

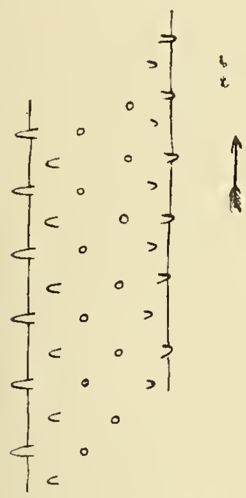

Fig. 218. *Eucirripathes spiralis* (Blainv.) v. Pesch. Arrangement of the spines (schema); the arrow indicates the direction towards the colony-top.

The colony of station 305, snapped of above the base, is 6.5 cm. high, and consists of a number of crowded spiral coils, from the base to the top. These 6 coils are sinistrorsal; the diameter of a coil is 2—3 cm,; each coil is secondary sinuous. The basal diameter of the axis is 1.75 mm., which value slightly increases (2 mm. in the middle of the second coil) to diminish afterwards gradually towards the rather blunt apex, the diameter of which is 1 mm. at a distance of only 1 mm. from the end. The colony is grown in a slanting direction, so that the horizontal plane through the top is only slightly higher than through the base. The polyps, which are in good condition, are arranged all of them on the distal outward side of the coils, always in a single series! (figs. 220, 221). The intertentacular distance is 0.75 mm. The sagittal tentacles of the same polyp are somewhat less than half a circumference of the axis apart; all the tentacles are short and often only knobshaped; the sagittal tentacles are the longest (550 μ) and largest ones. The lateral tentacles are inserted at a much higher level than the sagittal ones and very crowded. The oral cone is small, with a round mouth (fig. 220).

Fig. 219. *Eucirripathes spiralis* (Blainv.) v. Pesch. Top of a spine; 58.5 ×.

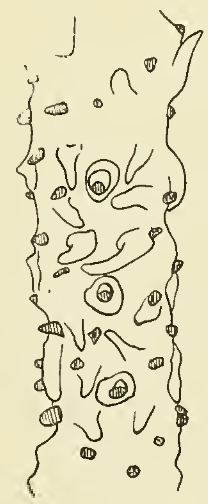

Fig. 220. *Eucirripathes spiralis* (Blainv.) v. Pesch. Polyps (oral view); 12.5 ×.

Fig. 221. *Eucirripathes spiralis* (Blainv.) v. Pesch. Polyps (profile); 12.5 ×.

The spines (figs. 218, 219) are inserted at right angles with the axis or slightly distally inclined; they are cylindrical (diameter 110 μ), blunt with their base not broadened. Their apex is covered with rough knobs and warts (fig. 219); the spines are arranged in 6 longitudinal rows, alternating in a straight quincunx; the rows of smaller spines are more crowded and 7—9 in number, and even more, viewed from their side of the axis. The longest spines can be found on the polyp-bearing side of the axis. Length 300—350 μ

for the longer spines, 50 μ for the smaller ones. Mutual distance for the longer spines 550 μ, for the smaller ones 650 μ; on some parts the latter are irregularly distributed and very crowded. The spines project very far through the coenenchyma as well as through the polyps, so that the polyps are scarcely to be seen separately with the naked eye. Young polyps are irregularly distributed between the adult ones.

One of the specimens from station 310, 7.5 cm. high, is a basal fragment with a straight, slightly curved stem of 5.5 cm. followed by a sinistrorsal spiral-coil, with a diameter of 1.5 cm. Basal diameter of the axis 2 mm.; 1 cm. above the base some irregular swellings are found and a small crest. The base itself is a half-globe fixed on a plate with numerous dendritic extensions towards every side. The polyps are very degenerated, except the oral cone, which is low, and the mouth (fig. 222); the rest of the axis is covered with coenenchyma, with some thicker parts, which however are not very clearly to be recognised as tentacles. The oral cone and the mouth are sagittally elongated; the sagittal diameter is 0.5 mm., the transversal one 0.3 mm. Interpolypar distance more than 1 mm. No cross-grooves are visible. — The larger and smaller spines are mingled on the same part of the axis, so that on opposite sides of the axis as many long ones as short ones may be found. But in the higher part of the colony, especially in the spiral, there is an inclination to have shorter spines on the non-polyp-bearing side of the axis. In this part the larger spines are arranged, for a short distance, in 6 rather regular longitudinal rows, alternating in a straight or slanting quincunx. All the spinal characters are the same as in the specimen from station 305; the long spines are somewhat shorter (250 μ), but they project far through the polyps, etc. (fig. 222).

Fig. 222. *Eucirripathes spiralis* (Blainv.) v. Pesch. Degenerated polyps at the colony-base; 8.5 ×.

The second specimen of the same station, 11 cm. high, without the natural base, is a sinistrorsal spiral, except the first 3.5 cm. which are straight. Diameter of the five coils: ± 1.5 cm. Between the 2nd and 3d coil is a sinuous part of 1.5 cm. The basal diameter of more than 1 mm. remains of an almost equal value; the broken top has a diameter of 0.6 mm. On the top-part there are 6 longitudinal rows of spines, and 3 on the base, alternating in a quincunx. Slight irregularities occur through the presence of supernumerary spines. Mutual distance is about 450 μ; length 300 μ and 120 μ or slightly less. Surface very knobby, especially in the basal part of the colony (fig. 223), while the entire surface is roughly granulated besides (omitted in fig. 223); on the top of the colony the spines are more slender (fig. 224). The polyps are the same as in the specimen of station 305; they are found on those sides of the axis where the spines are the longest, so that the spines project through the polyps. Interpolypar distance 1—1.3 mm. They are always arranged in a single series!

The third specimen, grown through a sponge, has $3^1/_4$ regular sinistrorsal spiral-coils with diameters of 2—5 cm.; the coils are somewhat oval. Height: 4 cm.; basal diameter 1 mm., gradually tapering towards the broken top (diameter 0.75 mm.). The polyps, which are violet, as in the 2nd specimen, are like those of station 274 and 305. Sometimes they are larger and more prominent, especially in the higher part of the colony (fig. 227). Sagittal tentacles: 1 mm.

long; interpolypar distance more than 1.5 mm. At the base of the colony the polyps are so very large (fig. 226) that the spines cannot project through them, although the spines are long

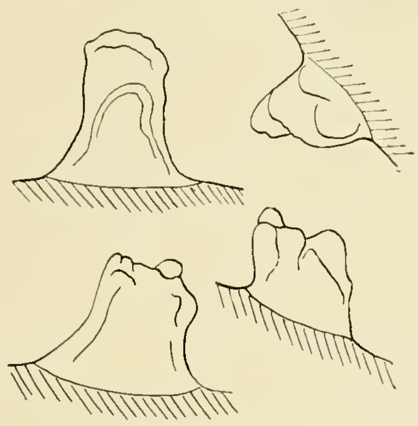

Fig. 223. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines on the base of a colony; 58.5 ×.

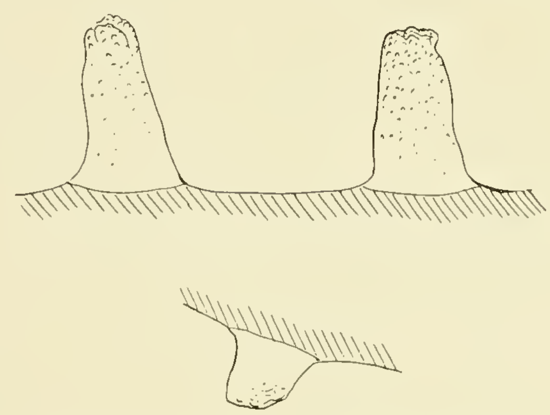

Fig. 224. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines on opposite sides of the first spiral coil; 58.5 ×.

(300 μ and 120 μ). The polyps are always arranged in a single series; young polyps occur between the adult ones. — The spines are arranged in six longitudinal rows and a straight quincunx; mutual distance 450 μ. The long ones are slightly distally inclined, cylindrical, with broadened base; surface entirely granulated; apex very rough. The short spines are more distally inclined, with a very slightly granulated, blunt top and a smooth base, concave distal side, convex proximal side (fig. 225).

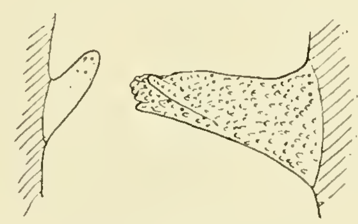

Fig. 225. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines on opposite sides of the colony-top; 58.5 ×.

The fourth specimen has its natural base and is entirely covered with violet polyps. Height 5 cm.; it consists of 3.5 sinistrorsal spiral coils, the diameter of which increases towards the colony-top, to 2.5 cm. Basal diameter of the axis: 0.5 mm., diminishing gradually; top is acute, through a sudden diminuition in diameter. Spines as in fig. 225; in the toppart they are somewhat more distally inclined. The polyps on the basal part of the colony are like fig. 226 and 227 but with their tentacles somewhat more outwards curved. Some of the polyps on the higher part of the colony are more like figs. 217, 220, 221. They are everywhere inserted in a single series! The oral cone is not striped, although the type of polyp is also often like figs. 231, 232. The spines are visible through the parts of the polyps; on some parts of the axis a cross-groove is visible between the polyps. Interpolypar distance 1.25 mm.

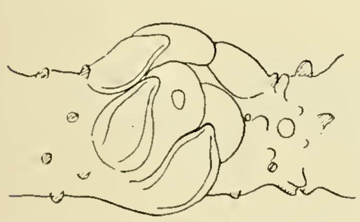

Fig. 227. *Eucirripathes spiralis* (Blainv.) v. Pesch. Adult polyp and young one on the top of the colony; 12.5 ×.

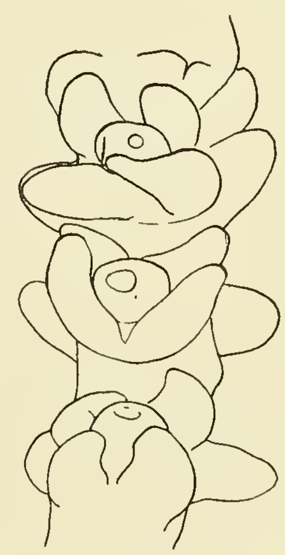

Fig. 226. *Eucirripathes spiralis* (Blainv.) v. Pesch. Polyps on the colony-base (slightly fore-shortened); 12.5 ×.

The fifth specimen of station 310 has $5^1/_4$ sinistrorsal spiral coils, with diameters of ± 2 cm. and a distance of 1 cm. or more. The basal diameter of the axis is 1 mm., which diminishes to 0.6 mm. at the top; after $^3/_4$ coil the diameter shows a sudden diminuition. The spines are like those of the other specimens; on the basal part the longer ones are thick, short and wartlike, knobby, with a flat, blunt apex;

the short ones are slender. On half of the colony-height the long spines are 240 μ while the opposite side of the axis is entirely smooth. The spines are arranged in longitudinal rows without further regularity, since the mutual distance is rather variable (max. 675 μ). The top of the colony bears spines like fig. 225, especially as to the short spines; here are 6 longitudinal rows, alternating in a quincunx. No polyps.

Fig. 228. *Eucirripathes spiralis* (Blainv.) v. Pesch. Arrangement of the spines on the middle of the colony; 12.5 ×.

The last specimen is 9 cm. high, with 7.5 sinistrorsal spiral coils, with increasing diameter (2—2.5 cm.; distance 1—1.5 cm.). The first 2.5 coils are followed by a sinuous part of 3 cm., before the other coils are formed. The basal diameter of nearly 1 mm. tapers gradually and is 0.5 mm. at 0.5 cm. distance from the top, which is blunt. — There are max. 8 longitudinal rows of spines (sometimes 6—7), alternating in a quincunx (fig. 228). Length of the spines 225 μ and 150 μ. Mutual distance 500—600 μ. The longest spines are situated on the polyp-bearing side, the distal side of the coils. The long spines (fig. 230) are blunt conical, at right angles with the axis or slightly distally inclined; the small ones are triangular, sharp or blunt (fig. 229) and more distally inclined. Towards the top of the colony the spines are more distally inclined, towards the base more upright. They project through the polyps. Surface slightly granulated or smooth; apex sometimes but rarely roughly knobby, especially at the colony-base, where one spine is even doubled.

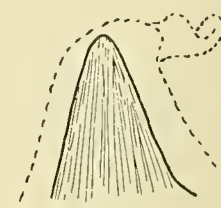

Fig. 229. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spine, projecting far into a tentacle; 58.5 ×.

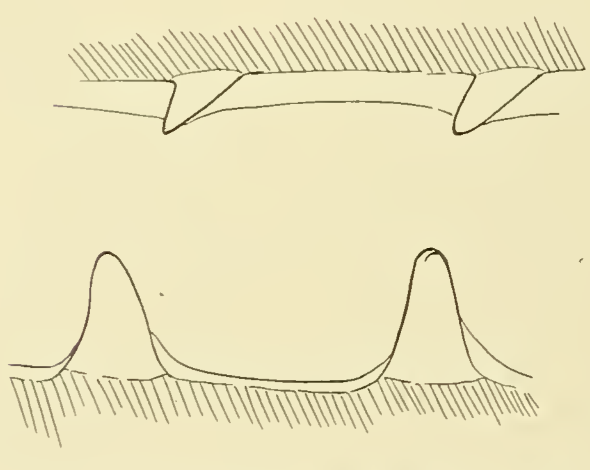

Fig. 230. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines on opposite sides of the middle of the colony; 58.5 ×.

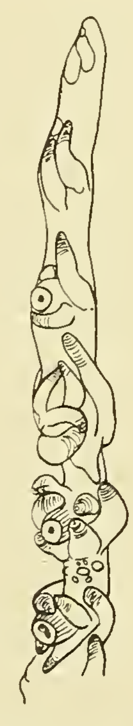

Fig. 231. *Eucirripathes spiralis* (Blainv.) v. Pesch. Polyps on the colony-top; 8.5 ×.

Fig. 232. *Eucirripathes spiralis* (Blainv.) v. Pesch. Polyps on the last but one spiral coil; 8.5 ×.

Fig. 233. *Eucirripathes spiralis* (Blainv.) v. Pesch. Oral cone; 58.5 ×.

The polyps (figs. 231, 232) are leadblue; the top of the tentacles is much lighter, yellow-white with brown wrinkles. The oral cone is white with 10 leadblue or brownish, vertical stripes which are situated between a same number of swellings (fig. 233). The interpolypar distance is

1 mm.; sagittal tentacles 0.6—1 mm., lateral ones 0.4 mm. or less. Height of oral cone: 0.3 mm., its basal diameter 0.35 mm., and its top-diameter 0.2—0.25 mm., but sometimes broader than at its base while the tentacles may be also longer. The sagittal tentacles are inserted at a much lower level than the lateral ones. All the polyps are inserted in a single series!

The specimen of station 164 is 13 cm. high, and consists of nearly 3 sinistrorsal spiral coils, with diameters of ± 5 cm. and a distance of 2—8 cm. Basal diameter of the axis: 1.1 mm.

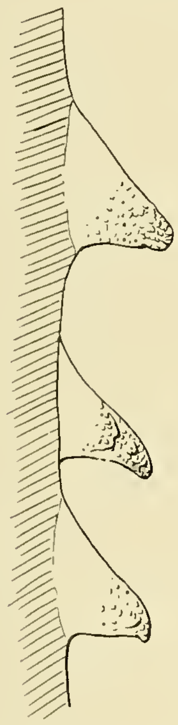

Fig. 234. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines on the colony-top; 58.5 ×.

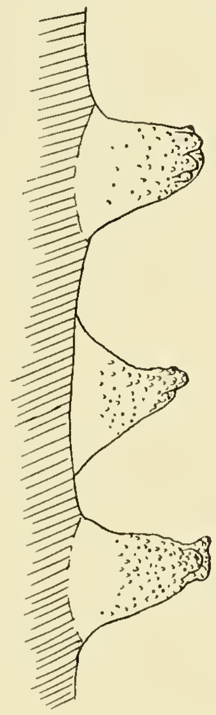

Fig. 235. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines on the colony-top; 58.5 ×.

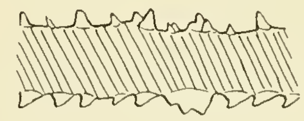

Fig. 236. *Eucirripathes spiralis* (Blainv.) v. Pesch. Abnormal spines on the colony-top; 8.5 ×.

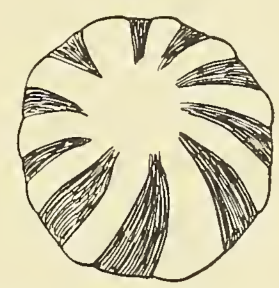

Fig. 237. *Eucirripathes spiralis* (Blainv.) v. Pesch. Oral cone; 58.5 ×.

The spines are arranged in 6—7 longitudinal rows, alternating in a quincunx. Their length is 200—300 μ, different on opposite sides of the axis, which is more conspicuous at the base of the colony than on the higher parts. Long spines: at right angles with the axis; short ones: distally inclined. Mutual distance 700—750 μ. They are blunt cylindrical or conical, with a very rough top and a granulated surface, except the base of the spines (figs. 234, 235); on some parts the spines show concrescence to a rather high degree (fig. 236). The polyps are situated on the upper- and outward side of the coils; on the younger parts they form a single series, but on the older parts they are arranged in several rows (however fig. 238 is a part, which was rather near the top!). Interpolypar distance more than 2 mm.; sometimes they are separated by a greater distance; many young polyps alternate irregularly with the adult ones. Sagittal tentacles 1.5 mm. long, lateral ones 1 mm.; height of the oral cone 0.4—0.5 mm. On some parts, especially at the base of the colony, the dimensions of the polyps diminish and they are very like those of station 305; alternating with these polyps are others with accidentally less contracted tentacles. The oral cone may be also smaller and lower. On

Fig. 238. *Eucirripathes spiralis* (Blainv.) v. Pesch. Polyserial arrangement of the polyps on part of a colony; 8.5 ×.

some parts of the colony the tentacles are crowded in a distally directed group, covering the oral cone (fig. 239). The sagittal tentacles are always inserted at a lower level than the lateral ones. The oral cone, less conspicuous than in the preceding specimens, also shows a like number of vertical stripes (fig. 237); the mouth is round but not always sharply defined. — The base of the tentacles is often leadblue in colour.

Fig. 239. *Eucirripathes spiralis* (Blainv.) v. Pesch. Polyps on a higher part of the colony than in fig. 238; 16 ×.

The specimen of station 156, without polyps, is 12 cm. long, and consists of two straight parts of 8 and 4 cm., connected at right angles with each other. The basal diameter of more than 750 μ diminishes regularly towards the broken top of 375 μ diameter; on a height of 4 cm. a sudden diminuition of the diameter to 575 μ takes place. The spines at the base of the colony are 450 and 150 μ long on opposite sides of the axis, with a mutual distance of 375—450 μ. There are no longitudinal rows or other regularities. Some spines are doubled over a great part of their length. The long ones are inserted at right angles with the axis; the shorter ones are slightly distally inclined. Their apex is very rough, knobby (fig. 240 *a*). On the higher parts of the colony this roughness increases (fig. 240 *b*). On the toppart of the colony the spines are more slender (fig. 241 *c*), their

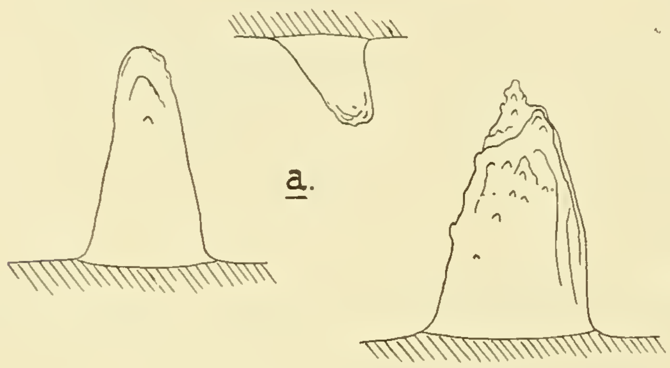

Fig. 240. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines: *a* on the colony-base; *b* on a higher part; *a*, *b* 58.5 ×.

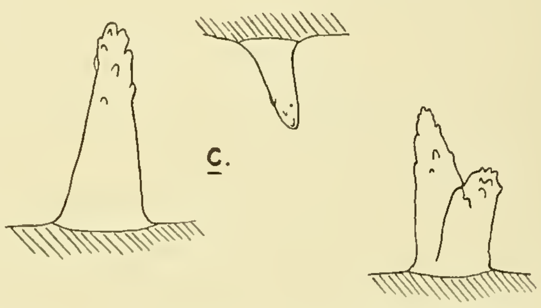

Fig. 241. *Eucirripathes spiralis* (Blainv.) v. Pesch. Spines on the colony-top: *c* normal ones; *d* forked one; *c*, *d* 58.5 ×.

length remains equal, and the distribution is entirely irregular. The long spines here are slightly distally inclined. Doubled spines occur (fig. 241 *d*). On some higher parts there are 6 regular longitudinal rows and a straight quincunx. Mutual distance is here 450 μ.

The characters of the specimens under discussion I have reviewed in the tabel on p. 165, which demonstrates that all these specimens, however divergent they may be in some points, appertain to one and the same species. While in the number of longitudinal rows, the shape of the spines, and the further characters of the spines no conspicuous differences are to be seen, the second and third column give rather divergent data; as to the length: for the longest spines from 225—530 μ, for the shorter spines from 0—225 μ, and as to their mutual distance from 450—750 μ. Usually the spines are covered with fine granulations, except the top which is covered with rough knobs; in one case the spines are almost smooth with rare knobs. Usually the spines are of different length on opposite sides of the axis, except with V where long and short spines are intermixed, which is a proof that this character is of no specific value, wherefore

STATION OR SPECIES	number of longitudinal rows and quincunx	length of the spines in μ	dist. of the spines in μ	shape of the colony	basal diam. in mm.	polyps	interpolypar distance in mm.	rows of polyps	spines project through the polyps	shape of the spines	surface of the spines	REMARKS
I. 156	irregular or 6 and str. q.	450 and 150	(375–) 450	two straight parts	0.75	?	?	?	?	blunt, conical	top with rough knobs	short spines (and the slender long ones) are slightly distally inclined; axis with a swift diminuition of diameter.
II. 164	6—7 and q.	300 and 200	700—750	sinistrorsal spiral	1.1	leadblue, large; thick high oral cone with vertical stripes; sag. t. at lower level 1)	more than 2	1 or several ones	yes	blunt, conical or cylindrical	top knobby; surface entirely granulated	the short spines are slightly distally inclined. 1) sometimes as in III.
III. 274	8 str. q.	530 and 225	675—750	part of a circle; sinistrorsal spiral is indicated	1	small, with knob-shaped tentacles. Low oral cone; sag. t. at lower level.	± 1.25	3, sometimes 2 or 1	yes	blunt, cylindrical with broadened base	top very rough; entire surface granulated	
IV. 305	6—9 str. q.	350 and 50	550—650	sinistrorsal spiral	1.75 1)	the same as in III (mouth round)	0.75	1	yes	blunt, cylindrical	top very rough; entire surface granulated	1) increases to 2 mm.
V. 310 α	6 sl. q.	250 and 50	550—650	straight part with sinistrorsal spiral	2	the same as in III (mouth and oral cone sagittally elongated)	more than 1	1	yes	blunt, cylindrical	top very rough; entire surface granulated	
VI. 310 β	6—8 str. q.	300 and 120	450	sinistrorsal spiral	1	the same as in III	1—1.3	1	yes	blunt, cylindrical	top very rough; entire surface granulated (very rough)	
VII. 310 γ	6 str. q.	300 and 120	450	sinistrorsal spiral	1	the same as in III (sometimes larger and more prominent)	more than 1.5	1	yes (not the larger polyps)	blunt, cylindrical	top very rough; entire surface granulated	
VIII. 310 δ	6 str. q.	300 and 120	450	sinistrorsal spiral	0.5	always larger like the exceptions in VII; on top of colony like III	1.25	1	slightly	blunt, cylindrical	top very rough; entire surface granulated	
IX. 310 ε	6 str. q.	240 and 0	max. 675	sinistrorsal spiral	1	?	?	?	?	blunt, cylindrical (very short on the base of the col.)	top very rough; entire surface granulated	
X. 310 F	6—8 q.	225 and 150	500—600	sinistrorsal spiral	1	leadblue, large; thick high oral cone with vertical stripes; sag. t. at lower level	1	1	yes	blunt, conical; smaller ones: triangular	smooth or very slightly granulated 1)	short spines distally inclined, as well as the longer ones in the toppart of the colony. 1) some spines on the colony-base have a slightly rough top.
XI. *Stichopathes* (?) *lütkeni* Br.	8	200 and 80	400	first part is straight; rest is a spiral	2	?	?	?	?	blunt, conical	entirely rough	small spines more acute, and distally inclined.
XII. *Stichopathes euoplos* Sch.	3—4	430—500	750	curved, no spiral	0.5	?	?	?	probably yes	blunt conical at right angles or distally inclined	top rough; base smooth	
XIII. *Stichopathes contorta* T. & S.	6 *)	?	?	sinuous and coiling	1	prominent oral cone with circular mouth; tentacles 0.5 mm.	2	1	?	conical ?	slightly but distinctly papillose	
XIV. *Cirripathes diversa* Br. †)	5—6 1)	225—300	± 625	sinistrorsal spiral	3	?	?	?	?	blunt, conical	top rough, base smooth	1) FORSTER COOPER gives 8–12, but figures 5–6; small spines, triangular, irregularly distributed between the larger ones.
XV. *Stichopathes regularis* F. C.	6	200 and 140	± 500	evenly coiled	1.25	circular; tentacles short; round mouth on a small oral cone	2	1	?	blunt, conical	top roughened	

†) According to FORSTER COOPER. *) According to THOMSON & SIMPSON's figure 3.

I have united *C. diversa* Br. with *Euc. spiralis* (Blainv.). — Usually the shape of the colony is a sinistrorsal spiral with crowded coils of a diameter of some cm., but occasionnally with some irregularly curved or straight parts. The basal diameter diminishes, with a single exception, gradually towards the top. The polyps are perforated by the spines, except when the polyps are of the larger type, another proof of the relatively slight generic value of Brook's *Aphanipathes*-character. The polyps especially are of a very divergent structure. The greater part of the specimens have a uniserial arrangement of the polyps so that I had considered them as *Stichopathes*-species in the preliminary investigation; if there is a polyserial arrangement of the polyps, together with an uniserial arrangement on other parts of the same colony the specimen is proof enough that we have an *Eucirripathes*-species in this case. The interpolypar distance also varies very much, from 0.75—2 mm. and even more, and there is no question about an error through the presence of young polyps. The polyps are principally of two types, one of which is represented by III (fig. 217) while the other is found with II and X (figs. 231, 232, 238). However the gulf between these very divergent types is overbridged by specimen VIII, where both types are present on one and the same colony. The remarkable vertical stripes on the oral cone are only found in two specimens: II and X, while they are absent in VIII.

The reduction of the polyps, which occurs to a high degree in specimen V (fig. 222) is described by Brook for various genera. According to him it occurs in *Eucirripathes* principally in the basal part of the colony, so that here the polyps are only to be seen as flat disc-like swellings with a mouth. It seems that the tentacles disappear first; fig. 222 agrees with these observations, but as a rule the reduction does not occur in all species and individuals; several of the described colonies did not show a trace of it.

The differences in structure of the polyps are too large to explain them solely by a different state of preservation, also since both forms are present on one and the same colony. The microscopical research, which in this species was very much hindered by the spines, which lacerate the polyps, when they are loosened from the axis, gave some differences, i. a. with the specimens II and IV; but not great enough to be of specific value. For the present it will be better to keep them together, or, at the utmost, to divide *Eucirripathes spiralis* in a number of varieties, so that III, IV, V and VI are grouped into a variety with small polyps (var. *aphanipathoïdes*) while a variety with larger polyps and striped oral cone (var. *striata*) is formed with II and X, and a third variety (var. *intermedia*), which is a transition between the other two, contains VII, VIII and IX.

Specimen I is joined to *Eucirr. spiralis* because of its spines; but as long as the polyps are unknown, there are not many arguments to be given in favour of this union. — Basing on the shape of the colony and the spines, figured by Brook, I consider the Siboga-specimens as *Eucirripathes spiralis*. The colony of the formerly described specimens is always a spiral with many coils, the diameter of which is always a few (2—3) cm. only. This shape is figured very clearly not only by Esper, Blainville, Ellis, Solander a. o. but also by Rumphius, who gives his specimen the name of *Palmijuncus anguinus*. It is true that Brook calls this specimen a "flexuose, non-spiral species" but it appears from this that Brook has not seen the figures in the Herb. Amb.; Brook's words only hold good for *Palm. vulgaris* and *Palm. striatus* but surely

not for *Palm. anguinus* — The spines, figured by BROOK, show that the type of spines of the species, described by him, are also blunt conical or cylindrical, although it is not well possible to give a decision about their surface. The number of longitudinal rows (± 9) agrees rather well with the Siboga-specimens, while I estimate their length, which is unequal on opposite sides of the axis, at 300 and 125 μ, with a mutual distance of 800 μ. All these data agree very well with the tabel on p. 165. BROOK's *Cirr.? diversa* may be joined with *Eucirripathes spiralis*, in view of specimen V of the Siboga-material.

Stichopathes? lütkeni Brook, the characteristics of which are given in the same tabel, may be, in my opinion, joined with *Eucirr. spiralis.* The number of longitudinal rows of spines, the shape and the length of the spines, their mutual distance, the shape of the colony, agree with the corresponding data of the *Eucirr.* specimens. As to the shape of the spines BROOK's figs. 28 and 28*a* on his Pl. XII may be compared with my figs. 216 and 225. BROOK himself mentions a "general resemblance to *Stichopathes filiformis*", but he says that in subspiral growth it is "intermediate between *Stich. filiformis* and the truly spiral species such as *Stich. pourtalesi* Br. and *Cirr. spiralis* (Linn.)". — So BROOK has also thought about a comparison of the latter species with *Stich.? lütkeni* but the spines, which are entirely covered with fine papillae have induced him to make a new species. But when we frequently find in the Siboga-specimens of *Eucirr. spiralis* spines with a rough apex, and also spines which are entirely granulated, the obstacle to unite *Eucirr. spiralis* with *Stich. lütkeni* is abolished.

Stichopathes (?) *euoplos* Sch. may also be mentioned among the species, which in many, but not all points, are very like *Eucirr. spiralis.* The polyps are entirely unknown and only on zoogeographical grounds, this single specimen is joined with the genus *Stichopathes.* The only specimen is a fragment of a colony; its characters are given in the tabel; the number of longitudinal rows is much less (3—4), but the length of the spines is equalled by specimens I and III, and the same holds good for the mutual distance of the spines; the colony is curved, without an indication of a spiral; the shape of the spine, which is the principal character of *Stich.? euoplos*, is without doubt very remarkable, but this type is also present in the Siboga-specimens; cf. for instance SCHULTZE's Pl. XIII, fig. 7 with my figs. 219, 223, 224, 225, 240, 241. — SCHULTZE remarks besides: "zuweilen haben die Dornen die Gestalt breiter Klötze, deren freies Ende sich in 2 oder 3 Kegelspitzen spaltet, offenbar Stadien einer Dornvermehrung während der Stamm in die Dicke wächst"; this type is also present in my specimens e. g. figs. 223, 240, 241*d*. The spines being of equal length on every side of the axis with *Stich. euoplos* Sch. may be explained through the non-spiral-shape of the axis, for especially on a spiral stem this different length of the spines may be found; usually the longest spines are inserted on the convex side of the coils. Beside the non-spiral axis, which may be partly explained by the specimen lacking the natural top, which could have been a spiral while the lower parts of the colony were only sinuous, the principal difference remains the small number of longitudinal rows of spines. But in the same manner as in *Eucirripathes Rumphii* v. Pesch a variety is formed with double the number of longitudinal rows (var. *polysticha*), we could join *Stichopathes? euoplos* Sch. with *Eucirripathes spiralis* as a variety with only half the number of longitudinal rows: var. *oligosticha.* — *Stichopathes contorta* T. & S. is in the shape of its colony very much like the

Siboga-specimen from station 305; the other data, not always implicitly given by THOMSON & and SIMPSON, are in accordance with the rest of the tabel. The authors record a likeness between their species and *Stich. lütkeni* Br., which is joined by me with *Eucirripathes spiralis*.

Stichopathes regularis F. C is in its characters, given in the tabel, well in accordance with the other specimens; the stem is regularly coiled, and, although FORSTER COOPER does not give a diameter of the coils, I deduce from his figure of part of the stem that the diameter of the coils is $\pm$ 1.25 cm.

The diagnosis should be emendated as follows:

COLONY: entirely or for the greater part wound in a sinistrorsal spiral; coils-diameter a few cm. (2—3); usually gradually tapering; unbranched; base may be straight or sinuous; apex rapidly tapering.

SPINES: blunt cylindrical or conical, with rough knobby top; at right angles with the axis, or slightly distally inclined (especially the shorter spines and the more slender long ones); unequal length on opposite sides of the axis (0—530 μ; average: 300 μ and 100 μ); mutual distance $\pm$ 500 μ; 6(—9) longitudinal rows.

POLYPS: arranged in 1 to several rows; interpolypar distance 1—2 mm.; mouth rounded or irregularly folded.

var. *aphanipathoides* v. P.

POLYPS: small, with knobshaped tentacles; oral cone not striped; length of tentacles 0.5 mm.; perforated by the spines.

var. *intermedia* v. P.

POLYPS: on one and the same colony either like var. *aphanipathoides*, or like var. *striata*, but without stripes on the oral cone; length of tentacles 1 mm.

var. *striata* v. P.

POLYPS: large oral cone with ten dark stripes; leadblue except the tops of the tentacles and the rest of the oral cone; length of tentacles 0.5—1 mm.; polyps are not perforated by the spines.

var. *oligosticha* var. n.

POLYPS: unknown; SPINES: in 3—4 longitudinal rows.

Former habitat: PALLAS Indic; ELLIS Moluccas; BRÜNNICHEN Norway (?); BAKER Mediterranean (?); ONDAATJE Ceylon; MURRAY Kurrachee; STOKES E. India; RUMPHIUS Ambon; SCHULTZE N. E. of Boavista, Cape Verde; THOMSON & SIMPSON Ceylon; BROOK (LÜTKEN) W. India; COOPER Salomon Atoll, Ceylon; Investigator collection, locality?

6. *Eucirripathes musculosa* v. Pesch.

Cirripathes musculosa v. P. VAN PESCH, Bijdr. t. d. kennis v. h. genus Cirripathes, p. 31 etc.

Stat. 313. Saleh-bay, East of Dangar Besar. Up to 36 M. Sand, coral and mud. 1 spec.

This colony, 17 cm. long, is fixed to a basal plate. The first 10 cm. are straight; the rest is curved into three fourth of a vertical circle. The basal diameter of 545 μ increases to 850 μ on a height of 4 cm., to diminish further regularly towards the broken top (195 μ). The first 6 cm. are covered with polyps: the rest is devoid of polyps. — The cross-grooves between the polyps are clearly visible as well as the longitudinal groove along the back of the axis, even at the base. For the greater part the polyps are arranged in a single series, but at the base this series is curved and irregularities occur, which reminds me of a young *Eucirripathes*-specimen rather than of a *Stichopathes*. At the base two polyps are situated even on opposite side of the axis, but a torsion is not impossible. The tentacles (figs. 243, 244) are very long, thin and transparent; the coenenchyma is also very thin. The interpolypar distance is 1.1 mm.; the oral cone is cylindrical, but somewhat sagittally elongated with a flat upper side; longest diameter: 0.55 mm., shortest one 0.35 mm., height: 0.35 mm. The mouth is sagittally elongated. Sagittal tentacles 1.75 mm. long, lateral ones ± 1 mm. However this length may be very variable; especially at the base of the colony very long tentacles may be found; the lateral ones may attain a length of even 2 mm. Usually the tentacles are entangled into an intricate greyish white mass. The spines (fig. 242) are in the basal part arranged in ± 8 longitudinal rows, alternating in a rather regular

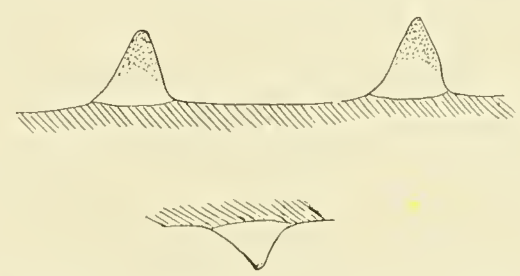

Fig. 242. *Eucirripathes musculosa* van. Pesch. Spines on opposite sides of the axis; 58.5 ×.

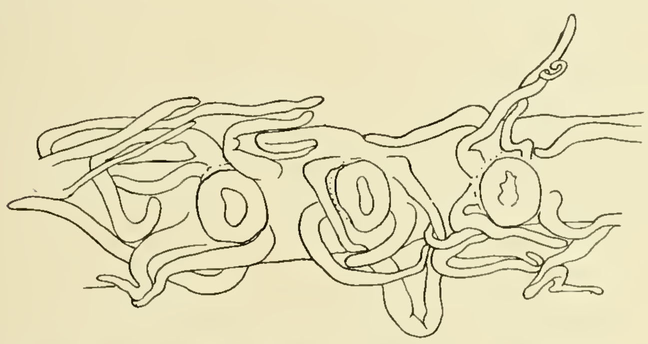

Fig. 243. *Eucirripathes musculosa* v. Pesch. Polyps in oral aspect; 16 ×.

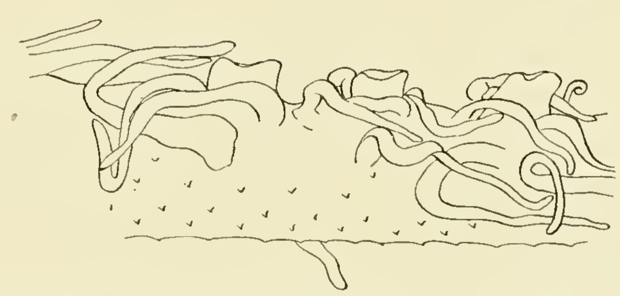

Fig. 244. *Eucirripathes musculosa* v. Pesch. Polyps in profile; 16 ×.

quincunx, with a mutual distance of ± 315 μ; on the higher parts there are 6—7 longitudinal rows. — The length of the spines is different on opposite sides of the axis: 150 μ and 75 μ. The top-half of the spines has a slightly granulated surface, while the shorter spines are almost entirely smooth, except the ultimate top. The shape of the spines is blunt, conical, at right angles with the axis; the sides of the smaller spines are often slightly concave. The species is in many points very like *Stichopathes variabilis* and it is found on one of the stations of its var. *longispina*. But i. a. on ground of anatomical differences (cf. the anatomical part) I have kept this species and *Stichopathes variabilis* apart; also the exterior of the polyps, i. a. the oral cone, is rather different.

Diagnosis:

Colony: non-spirally curved; regularly increasing and afterwards diminishing diameter.

Spines: blunt conical, at right angles with the axis; smaller spines with

concave sides; top slightly granulated, base smooth; different length on opposite sides of the axis (150 μ and 75 μ); mutual distance 525 μ; 6—7 regular longitudinal rows.

Polyps: irregularly(?) distributed around the axis; in the top-part: uniserial; tentacles long, thin and transparent; sagittal tentacles 1.75—2.5 mm., lateral ones 1—2 mm.; transversally elongated, cylindrical, truncated oral cone; interpolypar distance 1.1 mm.

7. *Eucirripathes Rumphii* v. Pesch.

Cirripathes Rumphii v. P. van Pesch, Bijdr. t. d. kennis v. h. genus Cirripathes, p. 33 etc.
Cirripathes? n. sp. Thomson & Simpson, On the Antipatharia, p. 95, fig. 8.
?*Palmijuncus vulgaris*. Rumphius. Herb. Amb. Lib. XII, c. 3.

Stat. 299. 10° 52'.4 S., 123° 1'.1 E. Buka- or Cyrus-bay, Rotti-island. 34 M. Mud, coral and Lithothamnion. 3 spec.
Stat. 305. Solor-strait. 113 M. Stony bottom. 1 spec.
Island Komodo near Flores; received from pearl-divers. 30 M. 1 spec.
Strait Boleng; received from pearl-divers. 1 spec.

The specimen of station 305 is only a top-fragment, with well preserved polyps. Length 6 cm.; it is the end of a sinistrorsal spiralcoil; basal diameter 245 μ; top blunt.

The spines (fig. 245) are arranged in $\pm$ 13 longitudinal rows, which may sometimes alternate in a quincunx. Sometimes the longitudinal rows are the only regularity. The length is sub-equal on opposite sides of the axis (105 μ) while the mutual distance is from 300—375 μ. The spines are inserted at right angles with the axis or slightly inclined; they are blunt, conical, with their surface covered with thick warts, especially on the top.

Fig. 245. *Eucirripathes Rumphii* v. Pesch. Spines; 58.5 ×.

The polyps (figs. 247, 248), although not accurately uniserial since especially the younger polyps deviate from this line, are arranged as in the subgenus *Stichopathes*. There are many young polyps inserted between the adult ones, so that the interpolypar distance is very variable (max. 6 mm.). The tentacles are very long and they are lying against the axis; often they form an intricate mass, which surrounds the greater part of the axis; the sagittal tentacles are 4.5 mm. long, the lateral ones are somewhat shorter but only very slightly so. The sagittal tentacles are inserted at a lower level than the lateral ones. The oral cone is high and often transversally compressed; its diameter is $\pm$ 1 mm., its height 0.6 mm.; the mouth is sagittally elongated, with a crenated border. The oral cone is covered with vertical grooves; broad bands alternate with narrower, darker stripes (fig. 247). The tentacles have a swollen base, with a basal constriction; the rest is sub-cylindral, with a blunt apex; they are yellowbrown with numerous brown points (fig. 246), which are especially to be found on the outside of the tentacles and less on the oral side; they are the numerous nematocysts-batteries with yellow nematocysts (cf. the anatomical part). — Between the polyps a cross-groove is visible while the longitudinal groove

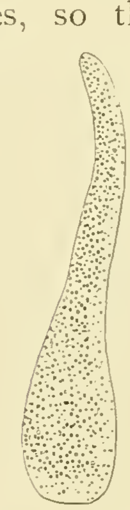

Fig. 246. *Eucirripathes Rumphii* v. Pesch. Tentacle with nematocyst-batteries; 7.5 ×.

is very deep and broad, and visible from 1.5 cm. above the basal end to 0.75 cm. from the top. On this point the groove becomes more and more shallow and indistinct.

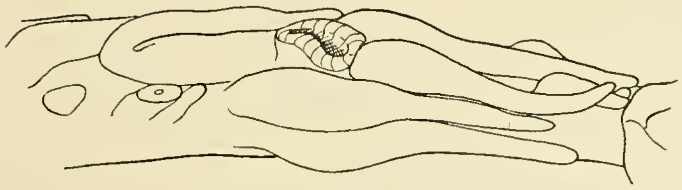

Fig. 247. *Eucirripathes Rumphii* v. Pesch. Adult polyp with two young ones; 8.5 ×.

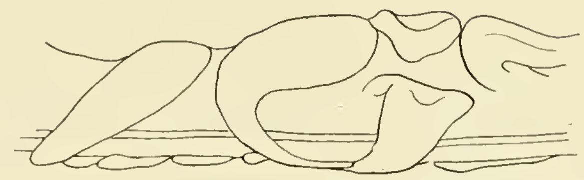

Fig. 248. *Eucirripathes Rumphii* v. Pesch. Polyp with longitudinal groove along the back of the axis; 8.5 ×.

One of the specimens of station 299 is a fragment in spirit, while the other specimens from this and the following stations are dried. — This fragment, 55 cm. long, is one spiral coil (the top-one) of a sinistrorsal spiral colony; diameter of the coil: 18 cm., basal diameter of the axis 1.6 mm. The polyps are not so well preserved as in the former specimen but the type is unmistakably the same. In the top-part the polyps are uniserially arranged but lower down it is very obvious that they are not placed in a single series, although they are found on one side only of the axis, or more precisely on two thirds of the circumference of the axis; it is not to be decided whether there are distinct longitudinal rows. The cross-grooves between the polyps are not always at right angles with the axis; they are especially conspicuous at the back of the axis, where the fine longitudinal groove is also visible; between the larger cross-grooves numerous fine ones are visible. The coenenchyma is thinner than in the preceding specimen, and so the longitudinal groove at the top is much less deep and broad. The spines (fig. 249) are slightly distally inclined; their top is covered with rough knobs; their length, subequal on every side of the axis, is 105 μ, and their mutual distance 300 μ. There are 12—13 longitudinal rows, alternating in a straight or slanting quincunx, but sometimes irregular.

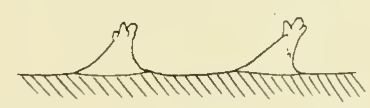

Fig. 249. *Eucirripathes Rumphii* v. Pesch. Spines at the base of a colony; 58.5 ×.

One of the dried specimens of this station is 4.5 m. long, fixed to a piece of coral the irregularities of which are followed by the basal plate, which is finely stratified. The entire colony is covered with polyps; spines and rests of coenenchyma are found even on the surface of the basal plate. The basal diameter of 10 mm. diminishes regularly towards the broken top (diameter 1.3 mm,). The first 1.20 m. are upright and slightly irregularly sinuous, with indications of a very steep spiral in some parts; the curves have smaller secondary bends. The rest of the colony is a very regular sinistrorsal spiral, the coils of which diminish in diameter towards the top from 23 to 15 cm. (the 6th coil). In a free-hanging condition the distance between the coils is 1 dm. The axis is very elastic; knobs or warts or swellings are entirely absent; however it is possible that the coenenchyma-covering makes eventual slight irregularities invisible. At the broken top the axial canal has a diameter of only 0.5 mm. The coenenchyma is dirty-greyish-brown, and bears numerous dried, shapeless, darkbrown polyps, which, near the top, are arranged in precisely the same manner as in the preceding specimen, and which are also the same in shape, although changed by the drying process. They cover nearly three fourth of the circumference of the axis; the rest is smooth. This smooth side of

the axis is found in the spiral part on the basal side of the coils; on looking in a distal direction through the spirals, no polyps are visible. — The lower the part of the axis we take, the smaller is the non-polyp-bearing band and on the non-spiral part of the colony the polyps are arranged on every side of the axis, without any smooth part. On the entire spiral and on part of the straight base the longitudinal groove along the back of the axis (on the smooth band) is to be seen as a shallow channel; besides there are numerous cross-grooves between the polyps, where the dried coenenchyma is often regularly cracked. The polyps are not arranged in special longitudinal rows. — The spines are the same as in the other specimens; length 135 μ; distance very variable (average: 330 μ); the entire spine is rough, knobby, especially the apex. There are very numerous longitudinal rows of spines on the older parts; but the regularity of the rows is not very great. Near the top there are ± 12 longitudinal rows with a quincunx. At the base the spines are distributed in an entirely irregular manner, as round (not elliptical!) knobs. The spines are less crowded than in the following specimen.

The other dried colony of the same station is 6 m. long, and lacks the natural base. The basal diameter of 11 mm. diminishes gradually towards the complete top, the diameter of which is 0.5 mm. On a height of 3 cm. there is a node of 16 mm. diameter, on a height of 11 cm. there is an angular curve, but for the rest the curves are very gradual. The first 1.5 m. are upright and wound into a very steep spiral; the following 1 m. is sinuous and contains an angular curve (120°), while the rest of the colony is a regular sinistrorsal spiral of 6 coils, the diameters of which diminish from 22 to 13 cm. towards the top with a distance of 1 dm. between the coils. On some places the axis has warts like the two following specimens. The entire colony is covered with polyps and coenenchyma, ditto as in the former specimen. But it is remarkable that the shape of the polyps is rather like those of *Eucirripathes anguina*, as was the case in the former specimen also but only on the lower parts of the axis. The spines are also the same as in the other specimens.

The specimen from Komodo is a present from Mr. J. Siso; the polyps are lacking, as well as the natural base and top. Length 4.5 m.; the first 1.5 m. are slightly sinuous; the rest is a sinistrorsal spiral with 2.5 coils, the diameter of which diminishes from 0.5 m. to 0.2 m. The basal diameter of the axis is 9.5 mm. and diminishes regularly; the broken top is 2 mm. thick. — The spiral is smooth and regular; only the first coil has secondary bends. — Very frequently warts occur on the axis, sometimes in groups on some parts of the colony. One of them is very like the beginning of a branch, with a length of nearly 0.5 cm.; its top has a scar, which may be the rest of a thin continuation of the wart. — The entire axis feels smooth and polished; the shape of the spines is not to be made out, probably through the energetic cleaning by scouring with sand, as Rumphius mentions for his *Palmijuncus vulgaris*. The spines are only small elevations, with an elongate, narrow base; their mutual distance is about 300 μ; the number of longitudinal rows is not very clear; on the top I estimate it at 15. — The specimen of Str. Boleng, without polyps, is broken into some fragments, which are complete except the top. The halfglobular base is fixed to a piece of coral. The base of the axis is oval in cross-section (diameter 13 and 10.5 mm.); diameter of the broken top: 3.25 mm. Length 3.5 m Shape of the colony is like the former specimen of Komodo. The highest coil is 15 cm. in

diameter and 35 cm. high; so the spiral is rather steep. Warts and secondary curves are found. The spines are numerous wart-like elliptical knobs, irregularly distributed, although parts of longitudinal rows are to be found; mutual distance ± 300 μ; there are 24 fragments of rows to be estimated on the toppart, but at the base this number increases.

It is not possible to doubt that these specimens belong together, in view of the shape of the colony, the dimensions of the spiralcoils, the shape and the dimensions of the spines, which characters are all of them subequal in all the specimens except for the last one which has double the number of longitudinal rows of spines, so that it may be considered as a variety (var. *polysticha*) of the normal type. The very great likeness between *Eucirr. Rumphii* and *Stichopathes pourtalesi* Br. in point of the polyps, does not hold good for the colony, etc. In my former publication on this genus I reviewed the characters of the Siboga-specimens and of *Stich. pourtalesi* in a tabel (cf. 22, p. 37); the data are deduced from the spines figured by Pourtalès, but this fig. is not so clear as to permit a reliable estimate. Although *Stich. pourtalesi* and *Eucirr. R.* are very like each other I have not combined them as in my former publication, since the examination of the other genera made it more probable that this *Stichopathes*-species had to be united with *Stichopathes gracilis* Gray (cf. the critical review of the formerly described *Stichopathes*-species), but both species are surely very nearly related. — I have named this species after Rumphius, since I deduce from the figures and descriptions of his *Palmijuncus vulgaris* that it is possible that he had a specimen of the here described species. However the shape of the colony and the basal diameter are not clearly given, but the figured colony is very like the basal parts of the Siboga-specimens. Its base shows a reduction of the polyps since Rumphius remarks that the "dunne, taaie, schors", which covers the axis is "ruiger" in the upper half of the colony than in the basal part. — The colony described by Thomson & Simpson as a possible new species of *Cirripathes* has at first a sinuous stem but is afterwards wound in three coils of a diameter of 7—10 cm. with a distance of 7—10 cm. between the coils. The spines are ± 100 μ long, near the top of the colony; the number of longitudinal rows varies from 20 at the base to 9 at the top, and so is intermediate between *Eucirr. Rumphii* and its var. *polysticha*. The spines are papillose. Although the polyps are absent, in my opinion T. & S.'s specimen ought to be joined with *Eucirr. Rumphii*.

Diagnosis:

Colony: base upright and sinuous or a very steep spiral; the upper part is a regular sinistrorsal spiral, the coils of which may be slightly secondarily sinuous; their diameter is a few dm.; sometimes warts on the axis; axis tapers gradually. Rarely beginnings of a branch.

Spines: conical with rough, blunt apex; at right angles with the axis or slightly distally inclined; of equal length on every side of the axis (± 120 μ); mutual distance more than 300 μ; 12 regular longitudinal rows.

Polyps: darkbrown; tentacles lying against and wound about the axis, (or in a group upright on the axis); oral cone sagittally elongated, with vertical stripes and bands; sagittal tentacles 4.5 mm., lateral ones ditto or slightly shorter; interpolypar distance max. 6 mm.; arranged in one

series on the top of the colony, but on two thirds of the circumference of the axis on the spiralcoils (distal side), not in regular rows; on the base of the colony on every side of the axis. Very conspicuous longitudinal groove, especially near the top; numerous cross-grooves between the polyps.

var. *polysticha* v. P.

SPINES: in 24 longitudinal rows on parts of the colony.

Former habitat: (? RUMPHIUS, Ambon); THOMSON & SIMPSON. Foul point (Ceylon).

8. *Eucirripathes* (?) *paucispina* (Brook).

Cirripathes? paucispina Br. BROOK, Antipatharia, Challenger Reports, p. 86, pl. XII, fig. 6; VAN PESCH, Bijdr. tot de kennis van het genus Cirripathes, p. 39 etc.

Stat. 95. 5°43'.5 N., 119°40' E. Sulu-sea. 522 M. Stony bottom. 1 spec.

Here are found two fragments, which are considered by me as parts of one and the same colony, although a middlepart is lacking, since their characters are very like each other. The basal part, 45 cm. long, is wound in $1^1/_4$ coil of a regular, very steep, sinistrorsal spiral; diameters of the coils is 5 cm., the height of a coil is 26 cm. Basal diameter of the axis: 2.5 mm., which value diminishes gradually to 1.4 mm. No polyps; spines in 10—11 longitudinal rows, alternating in a rather regular quincunx, which may disappear. The rows may be wound about the axis in a very steep spiral. Mutual distance of the spines: 450(—525) μ; the spines are only broad-based knobs, leaving one side of the axis entirely smooth. — The other fragment, 42 cm. long, has three coils (diameter 4 cm., height: 15 cm.) of the same type of spiral. Basal diameter of the axis 1.2 mm.; broken top: 675 μ. — No polyps; spines in 10 quincunxially alternating rows, with a mutual distance of 450—460 μ. Length: 150 μ and 90 μ on opposite sides of the axis. The spines are blunt with a slanting proximal side and a vertical distal side (fig. 250). Their top is rough, knobby, especially on the proximal side, or on the entire top. — The axis is shining, gold-coloured, with metallic lustre. In connection with this colour and the shape of the spines I have thought about a relationship to *Cirripathes? paucispina* Br.; they differ especially in the number of rows, which is only 3—4 with *Cirr.? paucispina* Br. The shape of BROOK's colony is not given. — I is only with a certain reservation that I have united both specimens.

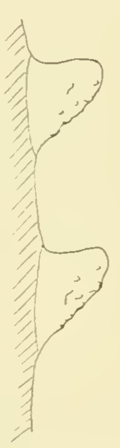

Fig. 250. *Eucirripathes* (?) *paucispina* (Brook). Spines; 58.5 ×.

Diagnosis:

COLONY: a regular sinistrorsal very steep spiral with a ratio of 1 : 4 or 5 between the diameter and the length of the spiralcoils; diameter of the coils 4—5 cm.; axis gradually tapering.

SPINES: triangular, blunt; rough top, especially on the proximal side;

different length on opposite sides of the axis (150 μ and 90 μ); mutual distance 450 μ; number of longitudinal rows 10 (Brook 3—4).

POLYPS: unknown.

Former habitat: BROOK: locality unknown.

Hillopathes g. n. [1]).

1. *Hillopathes ramosa* (v. Pesch).

Cirripathes ramosa v. P. VAN PESCH, Bijdr. t. d. kennis v. h. genus Cirripathes, p. 40, etc.

Stat. 313. Saleh-bay, East of Dangar Besar. Up to 36 M. Sand, coral and mud. 2 spec.

One of this specimens is a fragment without polyps; length 38 cm. It is curved in a part of a circle; the first 3.5 cm. are separated from the rest by an angular bend (135°). The axis is irregularly, almost imperceptably sinuous, with small curves. The basal diameter of 3 mm. scarcely tapers; the broken top is more than 2.75 mm. in diameter. The axial canal is only 375 μ in diameter. The spines (fig. 251) are slightly distally inclined, while their distal side is at right angles with the axis with the short spines, and nearly so with the long ones. The apex is blunt with the large spines, but acute with the short ones. The surface of the spines is smooth and shows a very fine granular structure. The spines are arranged in a rather irregular manner, but never entirely irregular. On large parts of the axis the longitudinal rows are clearly visible, but now and then they are upset by the splicing, diverging, and reuniting of rows. Besides there are spines irregularly distributed between the regular rows. There are 10 longitudinal rows, alternating in a straight quincunx; mutual distance of the spines usually 440—500 μ; length 390 μ and 255 μ on opposite sides of the axis.

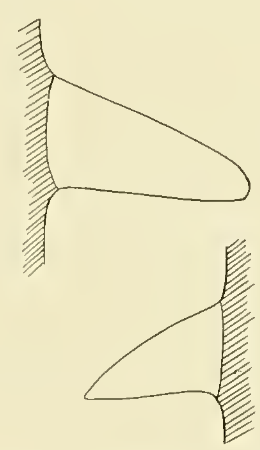

Fig. 251. *Hillopathes ramosa* (v. Pesch). Spines on opposite sides of the top-part of the colony; 58,5 ×.

The second specimen is very sparingly dichotomously branched. The length of the axis to the first branching is 61 cm.; one of the branches of the bifurcation is 33 cm. long, the other one 28 cm. The greater part of the axis is covered with polyps. The first 48 cm. of the fragment is curved in a half-circle; the following 13 cm. are at an angle of 130° inserted on the preceding part by a rather thick node. The branches are curved (perhaps all the curves are partly caused by the preservation vessel). All parts are as irregularly secundarily sinuous as the first specimen, and provided with nodes. The basal diameter is more than 2.75 mm. (so that possibly the first specimen is the basal part of this specimen), which remains sub-equal as far as the first branching. One branch has a basal diameter of 1.5 mm., increasing swiftly to 2.5 mm. with repeated diminuitions to a diameter of 2 mm.; on 15 cm. from the end there is a node, with a swift diminuition to ± 1 mm. The other branch is 2 mm. in diameter, repeatedly increasing to 2.5 mm. and again diminishing; on 12.5 cm. from the top there is a node with a diminuition to 1.75 mm. and on a distance of 1.5 cm. from the top a diminuition to 0.75 mm.; 0.5 cm. further a broken stump of a second

1) Cf. the generic diagnosis on p. 23.

bifurcation is found; the smallest, snapped-off branch is 0.75 mm. in diameter, the other one 1.25 mm. — In both bifurcations the angle between the branches is more than 30°.

The polyps (fig. 253) are not arranged in a single series but irregularly, by preference on the convex side of the axis, leaving the concave side entirely free. In connection with the arrangement of the polyps by preference on the concave axis-sides of spiral-colonies such as *Eucirripathes Rumphii* and others, these distribution with *Hillopathes ramosa* indicates, in my opinion, that the curving of the colony is for the greater part natural. The polyps are low and milkwhite; while the coenenchyma is so very thin as to make the black axis visible through this layer. — The spines project through the coenenchyma as well as through the polyps, since the longest spines are to be found on the polypbearing side. The six tentacles are radiate, but the sagittal ones are inserted at a greater distance from the oral cone than the lateral ones. The oral cone is very low with a large, round mouth, which may also be very much sagittally elongated (longest axis 0.7 mm., shortest one 0.2 mm.). The length of the tentacles is 0.3 mm. (somewhat less for the lateral ones) but usually the tentacles are very much contracted, even forming little indentions in the coenenchyma. Around the base of many tentacles the coenenchyma is folded and wrinkled in concentric circles. — There is a cross-groove between each polyp, but this groove is not at right angles with the axis (fig. 252); the greatest distance between two such grooves is 1.7 mm. Along the concave side of the axis the longitudinal groove is clearly visible. Young polyps alternate irregularly with the adult ones, but it is not possible to make out distinct longitudinal rows. To 1 cm. of the axis 8—12 polyps may be found, the young ones included. — In view of the perforating spines this specimen could be included into the sub-genus *Aphanipathes*; the mode of branching is very much like several *Euantipathes*-species, while the distribution of the polyps is typical for the sub-genus *Eucirripathes*, to which I had joined it in my first publication on *Cirripathes*. But because of the well developed branches, which are too long to include this specimen into *Eucirripathes* where only branches occur which are very short in proportion to the total length of the colony, I have made a new genus, which is a transition from the well-branched genera to the practically unbranched genera.

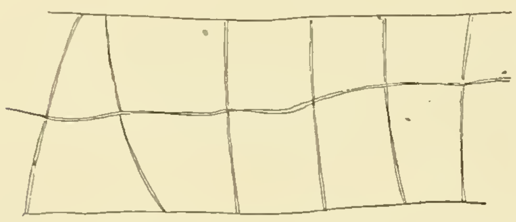

Fig. 252. *Hillopathes ramosa* (v. Pesch). Schema of longitudinal groove and cross-grooves at the back of the axis; polyps and spines are omitted.

Fig. 253. *Hillopathes ramosa* (v. Pesch). Polyps; most of the spines have been omitted; 8.5 ×.

Diagnosis:

Colony: curved; irregularly secondarily sinuous; sparingly dichotomously branched; swift diminuitions of diameter at several points of the axis (sometimes to half the preceding diameter).

Spines: long, conical, blunt or acute; slightly distally inclined; entirely smooth surface; 255 μ and 390 μ on opposite sides of the axis; mutual distance ± 470 μ; 10 longitudinal rows, which may become irregular.

Polyps: not uniserial; only on the convex side of the axis; low; round or sagittally elongated mouth and ditto low oral cone; tentacles knobshaped, max. length 0.3 mm.; interpolypar distance max. 1.7 mm.; coenenchyma very thin with clearly visible cross- and longitudinal grooves; 8—12 polyps to 1 cm. of the axis; the spines project through coenenchyma and polyps.

To his species incertae sedis Brook has added i. a. *Antipathes corticata* Lamarck (= *Hyalopathes corticata* Milne Edwards) as [*Antipathes*] *corticata* Lamk. This species is only very imperfectly described; the colony is dichotomously branched, in a not very dense way; the axis only shows a slight taper from base to apex. The spines are not described, and Brook says: "there seems every probability that the sclerenchyma in spite of its being glossy, has the essential Antipatharian characters". The polyps are arranged in two or three irregular rows!, the individuals being distributed at various points around the axis, and not in a linear series. Brook says: "I know of no other species approaching it in this respect but an examination of the polyps is necessary before its generic position can be definitely established. In form and distribution they appear more closely related to *Cirripathes* than to any other genus of which the polyps are known" (spaced by me, v. P.). Although the description does not permit a decision, it is highly probable that we have another species of *Hillopathes* viz. *Hillopathes corticata* (Lamk.) here. The black sclerenchyma, as well as the rather sparingly branched colony and the slight tapering of the axis are points which both species of this genus have in common, while the not-uniserial arrangement of the polyps is an obstacle to the joining of it to *Euantipathes*. — There goes a line from *Cirripathes* especially *Eucirripathes* (i. a. *Eucirripathes anguina*), via *Hillopathes ramosa*, *Hillopathes corticata* (Lamk.) to *Antipathes*, especially *Euantipathes*.

SUPPLEMENT.

Cirripathes densiflora Silberfeld is omitted in the description of *Eucirripathes anguina* (Dana). Diagnosis as well as description of the former species are not very characteristic; figures of spines or polyps are lacking. But on comparing my diagnosis of *Eucirr. anguina* on p. 152 with Silberfeld's description we find the following points which both species have in common: *1*. the colony-axis is sinuous ("gebuchtet"), *2*. the spines are at right angles with the axis, *3*. the distance between the spines is very variable, *4*. the top of the spines is blunt, *5*. sometimes the spines are more acute and slender, *6*. usually the polyps leave a narrow longitudinal streak open along the axis, *7*. the polyps are arranged in several longitudinal rows, *8*. the tentacles are heavily built, *9*. the mouth is a sagittally elongated slit.

The differences are very slight: the spines are 350 μ in length over against an average of 180 μ with *Eucirr. anguina*; the number of longitudinal rows of spines is 7 over against 12—14 with the other species. — Perhaps the latter difference can partly be explained through Silberfeld's specimen being possibly of a lesser age.

The similarity is very apparent and for these reasons I combine SILBERFELD's species with *Eucirr. anguina* (Dana). The list of synonyms on p. 149 should be enlarged with: "*Cirripathes densiflora* Silb. SILBERFELD, Japan. Antipatharien p. 19". To the former habitat on p. 153 should be added: "SILBERFELD: Uraga-canal (Japan)". In the diagnosis on p. 152 the length of the spines must be followed by: "(acc. to SILBERFELD: max. 350 μ)"; the number of longitudinal rows must be followed by: "(acc. to SILBERFELD: 7 on the younger parts?)".

The following data should be added:

on p. 29 in the list of synonyms: ROULE Antip. et Cérianth. p. 76.
on p. 37 in the list of former habitat: ROULE 31° 43′ 30″ N., 10° 46′ 45″ W. 2165 m.
on p. 50 in the list of synonyms after [*Ant.*] *bifaria* Br.: SILBERFELD Jap. Ant. p. 22, fig. 5.
and after [*Ant.*] *japonica* Br.: SILBERFELD Jap. Ant. p. 26.
on p. 52 in the list of former habitat: SILBERFELD Sagami-bay (Japan) 150 m.
on p. 102 in the list of synonyms: ROULE. Antip. et Cérianth. p. 75.
on p. 103 in the list of former habitat: ROULE: 43° 57′ N., 7° 06′ 45″ W. 300 m.; 37° 52′ N., 9° 15′ 45″ W. 552 m.; 38° 52′ 50″ N., 27° 23′ 05″ W. 599 m.; 15° 17′ N., 23′ 03′ 45″ W. 875 m.

ANATOMICAL PART.

REVIEW OF LITERATURE.

Up to the present the anatomy of the Antipatharia has been rarely searched, since sufficiant material with well-preserved polyps was seldom available. The first data were given by KÖLLIKER (1866)[1], and they relate to the mesogloea of *Antipathes subpinnata* E. & S. (= *Euantipathes subpinnata*). He found that the principal part of the polyps etc. is formed by a soft mucoid tissue with numerous small, irregular star-shaped cells; near the axis the coenenchyma, which contains (as in the Gorgonidae) alimentary canals, thickens into a firm layer of homogeneous connective tissue with numerous small spindle-shaped cells; a similar layer is found in the bodywall, beneath the ectoderm. Further he makes some remarks about the structure of the horny axis, which is stratified, just like the spines, which grow in layers; the horny substance is double-refractive.

VON KOCH gives in 1877[2]) beside his phylogenetic considerations, some anatomical data about *Antipathes larix* (= *Parantipathes larix*) Esper; the tentacles are covered with groups of nematocysts; all the mesenteries have a thin layer of connective tissue, covered on both sides with entoderm; the two largest ones have mesenterial filaments, straight in their upper part, convoluted in their lower part. The ovaria are situated in the broadest part of the mesenteries; the ova are lying in the connective tissue; they are large, conspicuous, with nucleus, nucleolus and yolk. — In 1889 (**2**) he gives some data about several Antipatharia from the Gulf of Naples. The most important results are: the microscopical anatomical structure is very simple; the ectoderm contains nematocysts, gland-cells, ciliated cells, and in the tentacles nematocyst-batteries; the entoderm is ciliated cylindrical epithelium. The ova and spermatozoa have their origin in the entoderm, and are surrounded by the mesogloea; the entire colony is either male or female, but never hermaphrodite. — The axis-epithelium is formed by cubic or cylindrical cells. — Only the transversal mesenteries bear mesenterial filaments, but in two *Antipathes*-species there are also epithelial thickenings along the free border of the sagittal mesenteries. There are 10 mesenteries, except in *Antipathes glaberrima* (= *Euantipathes glaberrima*), where there are 12.

BROOK (**1**) is the first who gives an extensive anatomical and histological research of

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1) Icones Histiologicae Abth. II, Heft 1.

2) Mittheilungen über Coelenteraten (Morphol. Jahrb. Bd. IV, Suppl. p. 74—86).

various species. Owing to the length of time which had elapsed since the Challenger collection was made, many of the specimens, preserved in strong spirit, did not satisfactorily show histological details: Also the small size of the polyps of most species made them difficult to handle; maceration was entirely impossible. BROOK made sections through *Antipathella subpinnata* E. & S. (= *Euantipathes subpinnata*), *Antipathella minor* Br. (= *Euantipathes minor*), *Antipathella contorta* Br. (= *Euantipathes contorta*), *Leiopathes glaberrima* Esp. (= *Euantipathes glaberrima*), *Parantipathes larix* (Esp.) Br., *Cirripathes propinqua* Br. (= *Eucirripathes anguina*), *Aphanipathes sarathamnoides* Br., *Pteropathes fragilis* Br. (= *Euantipathes fragilis*), *Tylopathes crispa* Br. (= *Euantipathes crispa*). BROOK relieves the very rudimentary condition of the muscular system and the homogeneous mesogloea, which does not contain connective tissue cells, except in *Cladopathes* where the very thick mesogloea contains some stellate cells. BROOK derives from his very extensive and precise descriptions, accompanied by very clear figures, the following points: the e c t o d e r m has the same structure as in the Actinia, but the nematocysts are nearly always collected in batteries, as is the case with many Madreporia, but hardly ever with Actinia. These batteries are surrounded by hyaline or by very deeply staining glandcells. There is always a nervous layer, often provided with ganglia. There is always a muscular layer but with a very variable development; some species have mesogloeal dentations to which the muscular fibres are applied (*Leiopathes* = pars *Euantipathes* and *Cirripathes* = *Eucirripathes*). The ciliated epithelial cells do not form so important a feature of the ectoderm as in Hexactiniae. The actinopharyngeal ectoderm is devoid of nematocysts, but there are found glandcells, a greater number of ciliated epithelial cells and frequently a muscular layer at its base, as is also the case in the bodywall beneath the insertion of the tentacles. The m e s o g l o e a is always hyaline or subfibrous without isolated connective tissue cells as in Hexactiniae; *Cladopathes* has a relatively thick mesogloea with isolated stellate cells. The e n t o d e r m usually contains only the hyaline type of glandcells: the surface frequently consists of an irregular cubical epithelium. No nematocysts; the muscular system may be rudimentary or absent; always a nervous layer. — In most types the entodermal surface of the mesogloea is smooth, with a more or less important layer of musclefibres applied to it, first recognisable in vertical sections of the actinopharynx. *Leiopathes* (= pars *Euantipathes*) and *Cirripathes* (= *Eucirripathes*) have their ectodermal and entodermal surface of the mesogloea dentate with a more or less convoluted layer of entodermal musclefibres. No musclefibres are found in the mesenteries, except in *Cirripathes propinqua* Br. (= *Eucirripathes anguina*) where both sides of the primary mesenteries bear muscular fibres, but too rudimentary to admit of a decision being taken on the direction of the fibres. BROOK remarks that these facts indicate that the entodermal muscular fibres are of later origin than the ectodermal fibres. The mesenterial filaments are found only along the free border of the primary transversal mesenteries; they bear a cap of ectodermal cells. The reproductive organs are developed in the primary transversal mesenteries only. They are of entodermal origin and are sometimes enclosed in a mesogloeal capsule. — Out of BROOK's anatomical descriptions I relieve the following points: the secondary mesenteries descend deepest on the actinopharyngeal side, while their connection with the bodywall ends on a much higher level. The actinopharyngeal ectoderm stains deeper than any other part, except the mesenterial filaments; at its surface

this ectoderm contains numerous deeply staining lens-shaped cells, while just below the surface numerous darkly granulated cells are found, connected by stalks with the base of the ectoderm. — Only in one single case BROOK saw rests of symbiotic Algae but he could not make sure of their occurrence. — The mesenterial filaments are of actinopharyngeal ectodermal structure; they never have lateral lobes; they are often branched, but only the ends of the branchings are ectodermal.

After this extensive research of BROOK there has not been published much on this subject. VAN BENEDEN (7) examined some (unnamed) forms and in the main he found the same facts as his predecessors. In the actinopharynx he always found a sulcus at one of the sagittal extremities, which sulcus is continued by a hyposulcus at the basal end of the actinopharynx, but VAN BENEDEN does not tell whether this sulcus is differentiated in microscopical anatomy, which, according to BROOK, is not the case. This sulcus is found between the anterior directive mesenteries. VAN BENEDEN corroborates BROOK's remark that the secondary mesenteries descend deeper on the actinopharyngeal side than on the side of the body wall.

The Valdivia-material described by SCHULTZE (**11**) contained i. a. a specimen of *Stichopathes gracilis* Gray, which was fit for microscopical examination but SCHULTZE only gives a figure (a section through the sagittal axis) but no description. Only the situation of the mesenteries is described, but without a particular feature. From the figure (SCHULTZE's Taf. XIII, fig. 2) may be deduced that the mesogloea contains fibrillar connections between ectoderm and entoderm. SCHULTZE remarks in his introduction: "die Konservierung mit Formol und mit Alkohol hat brauchbare Übersichtsbilder gegeben; was auf diesem Wege zu ermitteln war, hat BROOK an den Antipatharien der Challenger-Expedition beschrieben; ein tieferes Eindringen in histologische Feinheiten erfordert jetzt Macerationspräparate, und die müszte sich der Spezialist selbst, von lebendem Material ausgehend, herstellen".

Finally L. ROULE (**14**) examined three species viz. *Antipathes aenea* v. Koch *(= Euantipathes dichotoma)*, *Leiopathes glaberrima* Esp. *(= Euantipathes glaberrima)* and *Stichopathes Richardi* Roule, (= *Stichopathes filiformis* (Gray) Br.) but through the bad state of preservation the results were not very important. ROULE corroborates BROOK's data, especially as to the absence of an actinopharyngeal sulcus, and the continuation of the secondary mesenteries to a lower level on the side of the actinopharynx. He doubts the presence of nematocysts in the ectoderm. *Stichopathes Richardi* R. was in such a state that only the mesogloea remained, which according to ROULE, is the principal part; but the loss of the ectoderm and the entoderm is the more inconvenient, since ROULE concludes from his research that neither *Antipathes*, nor *Leiopathes*, nor *Stichopathes* have a muscle system (!) Too much value is given to this by SILBERFELD (**21**, p. 26), since the very scanty material and its condition did not permit of such a generalisation. — ROULE finds a very variable thickness of the mesogloea and explains this by the supposition that the genera with an unbranched colony (*Stichopathes*) or without spines (*Leiopathes*) compensate this loss of support by an exceedingly thick mesogloea.

Here and there in his systematic descriptions SILBERFELD (**21**) gives anatomical details also. With his specimen of *Stichopathes filiformis* (Gray) Brook (= *Stichopathes variabilis*) he remarks that the very thin mesogloea is incompatible with ROULE's opinion on this point for the unbranched genera; with *Stichopathes japonica* Silb. (= *Euantipathes longibrachiata*) he finds

a thick mesogloea with numerous fine radiate fibres from ectoderm to entoderm, but without cells. With *Antipathes (= Euantipathes) densa* Silb. he states ectodermal longitudinal muscle-fibres in the tentacles, especially on the actinopharyngeal side, and also delicate muscle-fibres round the mouth. *Antipathes grandiflora* Silb. (= *Euantipathes dichotoma* (Pall) em.) has also longitudinal muscle-fibres in the tentacles but on every side of equal distinctness.

A. Thomson (16) made sections through his material of the Scottish Antarctic Exp. but the preservation in formol appeared to be a very bad fixative for microscopical anatomical research so that the sections were not serviceable.

In my publication on *Cirripathes* (= *Eucirripathes*) I gave an extensive description of the microscopical anatomy of this subgenus, eight species of which could be examined. Since I repeat this description for the greater part unchanged, in the following pages, I can forego a review of it. I only want to remark that, in connection with the peculiar course of the mesenteries, for which I had not made sufficient allowance, some strange deviations in the mesenterial musclesystem could be explained and easily eliminated, so that I have more certainty about the normal state of this musclesystem in all Antipatharia.

I must finally add that, before my publication, there were known two modes of growth of the colony; the new polyps are formed at the end of the colony, but they also originate very frequently between the adult polyps on the older parts of the colony. In the latter case the coenenchyma in the interzooidal areas forms an oral cone, round which the tentacles are formed; at last the oral cone breaks through and gives origin to the mouth.

TECHNICAL REMARKS.

When making a series of sections with a microtome one encounters peculiar difficulties with all Antipatharia since the older parts of the horny axis are too hard and brittle to be cut. I could only make sections through the top-parts of the colonies, where the axis is still thin, after having enclosed them in paraffin with a high melting point (60°). In this manner I got rather efficient sections, although the axis itself was rarely well cut; often the axis was broken up into fragments, frequently rending the polyps and the coenenchyma. — When the axis was older I had to sever the polyps, etc. from the axis, before I could make sections through them; this method however has many drawbacks: the axis epithelium itself got lost for the greater part, and the polyps themselves were often damaged, since the spines project frequently through them. Therefore some species, which had very well developed and preserved polyps, did not give available series of sections. In many species however, and sometimes in several varieties of the same species, I was successful in severing the polyps in a good state; if possible I cut several individuals of each species. — All the specimens were preserved in spirit without a preceding fixation, which, we regret, is very difficult at a deepsea-expedition. Usually I stained the sections (mostly 3 μ in thickness) after the cutting, partly with Delafield-haematoxylin, partly with haemalum. From these stainings, both of which were equally efficient, I prefer the haematoxylin since it admits of a much better and clearer differentiation. — In view of the

examining of the mesenteries I made horizontal sections by preference (across the actinopharynx), while, according to Brook, the mesenteries could be best studied in these sections. — When the material was abundant, I also made vertical cross-sections (at right angles with the transversal axis of the polyps), while in rare cases also vertical longitudinal sections could be made (at right angles with the sagittal axis of the polyps); however in the latter case the axis itself, which was cut over its full length, gave very great difficulties. — Before describing the sections, I have to make a few remarks about the direction in which the polyps are attained, because of the peculiar position of the polyps on the axis. Rarely the oral cone is at right angles with the axis with an actinopharynx, which descends as a straight tube; in this case only the mesenteries could be studied best in horizontal sections. But usually the polyp is situated as is figured in fig. 254 (vertical longitudinal section, schematized). The oral cone is curved distally so that the mouth is not horizontal; the lateral tentacles are curved around the mouth and the distal pair is smaller than the proximal pair. The actinopharynx is in its upper part curved distally, but in its lower part this curve is directed proximally. In fig. 254 the primary transversal mesenteries (blackened) are attained over their full length. It will be clear that in this case, in horizontal sections, the upper part of the mesenteries is cut obliquely instead of across, and so is less efficient for the study of the direction of the musclefibres. This part of the mesenteries will be attained in a vertical cross-section of the polyps in a manner far more efficient to show the longitudinal musclefibres. The same longitudinal fibres in the lower part of the mesenteries, will be especially visible in horizontal sections and not in vertical cross-sections. As the mouth is usually neither horizontal, nor vertical (as is figured in fig. 254) it is easy to see why the muscle system on the mesenteries, found by me, was not at all or not clearly observed by other authors, or that they were not able to observe a special direction of the musclefibres. In the horizontal sections though, made by Brook for preference, he cut the mesenteries always obliquely in their upper part, where the musclefibres are principally developed. — It is also possible, through the peculiar curved shape of the actinopharynx, that in part of the series of sections the longitudinal musclefibres are attained in a manner which makes them clearly visible, while in an other part of the same series the transversal musclefibres are more conspicuous, and so, if one makes no allowance for the curve of the actinopharynx, they give the impression of being also longitudinal musclefibres, while apparently the direction of the sections is not changed with regard to the axis of the actinopharynx. It is also possible that for the same reason I some time wrongly supposed that the longitudinal musclefibres on both sides of the actinopharynx were not applied to the same side of the mesenteries of one and the same pair.

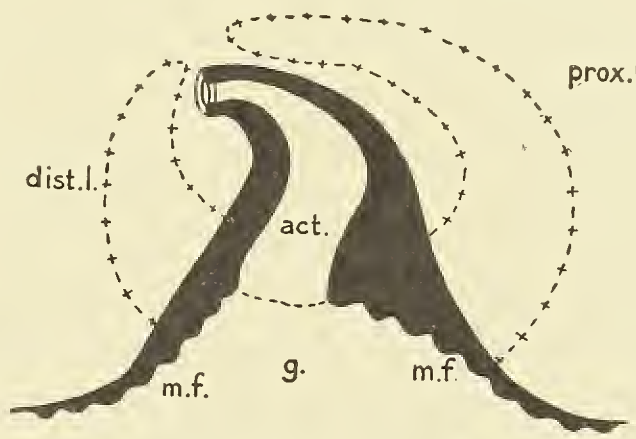

Fig. 254. Schematical vertical longitudinal section through a polyp.

The oral cone bends distally (to the left). The primary transversal mesenteries are black. The free border of the actinopharynx is dotted. The lateral tentacles which are lying before the plane of the figure, are indicated by a line of dots and crosses; the distal lateral tentacle (*dist. l.*) is smaller than the proximal one (*prox. l.*); *m. f.* mesenterial filaments; *act.* actinopharynx; *g.* gastral cavity.

I have made use of the terminology of van Beneden, while I follow Brook in the choosing of the sagittal and transversal axis of the polyps, notwithstanding Schultze's remarks on this subject, which are in my opinion refuted by the results I obtained.

MICROSCOPICAL-ANATOMICAL DESCRIPTION.

1. *Eucirripathes anguina* (Dana) em.

Tentacles (Pl. I, figs. 1, 2 and 3). The ectoderm is 80 μ and papillose, with a thickness of 25 μ between the papillae. In these papillae the epithelial cells diverge fan-like towards the periphery. There are no nematocysts. Deeply staining granular glandcells are rather numerous in some places, especially near the base of the tentacles, but in other places they are absent. The fibrillar nervous layer is separated from the mesogloea by a clear space. There are longitudinal musclefibres, lying against short mesogloeal lamellae, which are continued by the bases of the epithelial cells. The mesogloea, 80 μ at the tentacular base and 20 μ at its top is a homogeneous layer, in which there are a few cells distributed in an irregular manner. These sharply defined cells are oval or round but never stellate. Their diameter is 5 μ and they have a large round nucleus. The entoderm (50 μ) contains hyaline glandcells but no deeply staining glandcells. The entodermal cells are slightly deeper staining than the ectodermal cells. There is no nervous layer. There are circular musclefibres, sustained by the same mesogloeal lamellae as in the ectoderm; these fibres are less developed than in the ectoderm.

The bodywall (Pl. I, fig. 4) is of the same structure as the tentacles, except that the crowdings of deeply staining glandcells are very extensive in the ectoderm. These glandcells extend over the entire height of the ectoderm or over its basal half only. There is no entodermal muscle-layer but the ectodermal fibres are visible although less than in the tentacles; their direction is parallel with the axis of the colony and they are supported by small mesogloeal lamellae.

Actinopharynx (Pl. V, fig. 15). Its narrow lumen is very much sagittally elongated and the wall is folded in concord with the places of attachment of the mesenteries, especially in the upper part of the actinopharynx. The ectoderm (25—50 μ) contains many large hyaline glandcells together with a superficial layer of deeply staining actinopharyngeal glandcells, which makes this ectoderm easily to be distinguished from the ectoderm of other parts, except for the mesenterial filaments. The sagittal ends of the actinopharynx have a thicker ectoderm but of the same structure as the rest; they descend to a greater depth than the rest of the actinopharynx. In several places, especially near the middle of the actinopharyngeal lumen, the ectoderm contains an accumulation of yellowbrown pigment, the granula of which are 1 μ or less in diameter. There are no nematocysts or musclefibres. The mesogloea is only 2.5 μ thick, and increases in thickness on the places of attachment of the mesenteries. The entoderm (12—18 μ) contains only a few glandular elements, and no musclefibres.

Mesenteries (Pl. I, figs. 5, 6, 7, 8, 10 and 11; Pl. V, figs. 10, 11, 12, 13, 14, 15, 16 and 23). The course of the mesenteries sometimes is not easily to be distinguished through the

inclination of the oral cone and through the fusion of mesenteries with actinopharyngeal folds. Each pair of primary sagittal mesenteries is attached to such folds in two places (Pl. V, fig. 11). At a lower level in the oral cone the mesentery is loosened from one of these folds but fixed on a second place to the bodywall at the base of the sagittal tentacle (Pl. V, fig. 13). In this same fig. 13 the upper part of a blind interseptal room is figured (*I. r*[1]), the wall of which is formed by the upper part of a secondary mesentery towards the side of the gastral cavity; this secondary mesentery in its upper part is not extended between bodywall and actinopharynx, but between two folds of the actinopharynx. At a still lower level (Pl. V, fig. 14) this secondary septum is fixed to the bodywall also. The secondary septum does not extend far enough upwards to reach the top of the oral cone. — The mesenteries consist of a thin mesogloeal lamella and entoderm of varying thickness, and of the same structure as the actinopharyngeal entoderm. The primary transversal mesenteries and the secondary mesenteries have unilateral mesogloeal lamellae (Pl. V, fig. 10). One of these mesenteries is enlarged in Pl. V, fig. 23, and one of the secondary ones in Pl. I, fig. 8. These mesogloeal lamellae are continued by the bases of the entodermal cells; dark polished cross-sections of longitudinal musclefibres are arranged in a regular manner against these lamellae (Pl. I, fig. 8). These musclefibres are entirely absent at the other side of the mesenteries. — None of the many series of sections gave a very clear insight in this musclesystem; the longitudinal muscles are found on those sides of the secondary mesenteries, which are averted from the primary transversal ones, but I am not very sure of the fact that these fibres also occur on the primary sagittal mesenteries, on the side averted from the transversal ones.

Reproductive organs. All the polyps contain ovaria, but no testes; the colony is probably not hermaphrodite. The ova are found in the primary transversal mesenteries only in such large numbers that they fill almost the entire gastral cavity. The mesenterial mesogloea, which is easily to be distinguished in that part of the mesentery which is nearest the bodywall, is dissolved in the fertile part into a quantity of undefinable fibres, so that the ovaria have no clearly defined mesogloeal capsule. In some places parts of the mesogloea are visible (Pl. I, fig. 7). The mesentery is enormously swollen by the ova. The ova (Pl. I, fig. 6) are heavily laden with yolk. The protoplasma is gathered round the large nucleus, which contains a large nucleolus, often with some smaller ones. Although the shape of the ova may be so much influenced by plasmolyse that there is a semblance of an egg-cone, as is described by Hertwig for the Actinia, such an egg-structure was not observed with certainty. The swift resolving of the mesogloea renders it impossible to make out in what manner the primordial germ-cells are encased in the mesogloea.

The mesenterial filaments (Pl. I, fig. 11) are found along the primary transversal mesenteries only. They are repeatedly branched (Pl. V, fig. 16) so as to fill a large part of the lower half of the gastral cavity. They are immediately to be recognised by the typical, brown pigmentation, which is very dense here and which was also present in the actinopharynx-ectoderm. The structure of the ectoderm is the same as in the actinopharynx. The mesogloea of the mesentery is broadened at the base of the filament and contains oval connective tissue cells. This broadened part is forked in two branches, which are at a very wide angle one with the

other. These branches are soon so finely branched that they can not be followed. The ectoderm contains a very dark pigmentation as a sharp limit against the entoderm; distally this pigmentation is gradually less dark, while the middle of the ectoderm contains hardly any pigment. In this not-pigmented part large hyaline glandcells occur but nematocysts are absent everywhere. The left and right corner of the filament-section, towards which corners the mesogloeal branches are directed, are deeply stained just as the actinopharynx-ectoderm. Since the filament is only single-lobed, without a nematocyst-glandular part and two ciliar parts, it is difficult to compare it with a complete filament; probably we have a combination of both parts here, but yet without nematocysts. The filaments do not occur along the entire free border of the transversal mesenteries; in its distal part this border is free from an ectodermal cap. These parts are swollen (Pl. I, figs. 5 and 10). — The broadened mesogloea contains a very large number of cells (fig. 10) and sometimes there is no sharp limit between these cells in the mesogloea and the same type of cells in the entoderm (fig. 5). In these distal parts of the mesenteries there are slightly developed musclefibres on both sides of the mesogloea, and all of them parallel with each other and with the free border. In view of the polyp-schema (fig. 254) this can be explained by the longitudinal musclefibres diverging in the shape of a fan in the basal part of the transversal mesenteries by the broadening of these mesenteries. So they are in that part of the mesentery which is next to the bodywall subparallel with the transversal fibres.

Parasites. In several places the entoderm of the bodywall and the tentacles contains Algae (diameter 7—10 μ). The ectoderm of the bodywall contains Algae (diameter 3 μ) at a very low level in the epithelium; their colour is yellow greenish.

We regret that Brook's anatomical description of the polyps of *Cirripathes propinqua* Br. (which I joined to *Eucirripathes anguina*) are very incomplete through bad preservation. Brook's data of the thickness of the various layers in the tentacles do not differ very much from those of *Eucirr. anguina*, while Brook also describes mesenterial musclefibres and others, but without a definite direction.

2. *Eucirripathes nana* v. Pesch.

Tentacles (Pl. I, figs. 9, 12, 13 and 17). The ectoderm is papillose with a thickness of 45 μ at the utmost. There are no musclefibres, or only very slightly developed ones; mesogloeal lamellae are absent also. The thin nervous layer is found very near the mesogloea. The epithelium contains large nematocyst-batteries, not only on the top of the papillae but in the intervening grooves also. These batteries consist of nematocysts, arranged in the shape of a fan; the batteries are surrounded by deeply staining glandcells, while there is an increased number of epithelial nuclei below the batteries. Usually these nuclei are somewhat elongated. Figs. 12 and 17 on Pl. I give the structure of these batteries; the glandcells surround the battery at every side; the nematocysts are separated one from the other, but there are no special sustaining cells to be seen; some cells are smaller and thinner but without any difference in quality. The mesogloea varies from 27 μ at the tentacular base to 2 μ or less at the top. There are circular ridges on the entodermal side, at the top of the tentacle (Pl. I, fig. 9).

These ridges are continued by the epithelial cells. The homogeneous layer is almost free from cells; a few rare cells occur in places. At the base of the tentacle, where its wall is continued by the peripheric bodywall, the mesogloea contains a number of fibrillar connections between ectoderm and entoderm. Here the mesogloea is thinner (Pl. I, fig. 13); the fibrillae, unbranched over their entire length, give the impression of being protoplasmatic connections with local swellings; on the mesogloeal limits they are continued by the bases of the respective epithelial cells. These fibrillae are not found on the transition of tentacle and oral cone. In some places (fig. 13, to the left!) these fibrillae end near the ectoderm and branch into a very fine tissue, in a layer parallel with the mesogloeal limit. These branches are too fine to be followed. — The entoderm is 12 μ or less; the papillose structure is even more defined than in the ectoderm; the diverging epithelial cells are in the periphery only in contact (Pl. I, fig. 9). Deeply staining glandcells are absent, as well as nematocysts. The nuclei are somewhat larger than the ectodermal nuclei, and more rounded.

Bodywall (Pl. I, figs. 14, 15 and 16). The ectoderm is thinner than in the tentacles; it contains, together with the numerous supporting cells with small, elongated nuclei, hyaline glandcells, and also deeply staining ones, but the latter are rare and only locally more crowded. There is a nervous layer but no muscular layer; the former is very deeply seated and contains a small number of nuclei which are exactly like those of the epithelial cells. There are no nematocyst-batteries, but a few single nematocysts occur (Pl. I, fig. 16 at the bottom). The mesogloea varies from 6 μ at the top to 50 μ at the base of the tentacles and is a homogeneous layer. In some places cells may be found (Pl. I, fig. 14); one or two of these cells, with deeply staining round nuclei, are inclosed in oval or round mesogloeal cavities. The entoderm is the same as in the tentacles.

Axis. Pl. I, fig. 20 gives a section trough the axial connection with the bodywall. Nowhere a cicatrice or groove is to be found in the ectoderm of the bodywall as a rest of the formation of the axis. The connecting septum is short and broad. The axis-entoderm is the same in structure as that of the bodywall, especially in the shape of the nuclei. The axis-ectoderm, which is ontogenetically to be derived from the bodywall-ectoderm, is in structure and the shape of the nuclei entirely like the entoderm, probably through the influence of the changed function and situation. There are no glandular elements. — The mesogloea is very thin, so that the fibrillar bases of ecto- and entoderm leave no homogeneous layer between them. The axis itself is concentrically stratified, with alternating layers of a more or less refractive substance. The axial canal is surrounded by a brown axis-intima. — The axial epithelial layers are continued over the spines, and this sheath of the spines is often fused with the entoderm and the mesogloea of the bodywall (Pl. V, fig. 21, where the section is made near the top of the colony so that the axis fills almost the entire polypar cavity). In Pl. V, fig. 19 the axis-mesogloea is even grown together with the mesogloea of one of the primary mesenteries. — The axis-ectoderm is usually thickened at the base of the spines (Pl. V, fig. 21).

Actinopharynx (Pl. I, fig. 19; Pl. V, figs. 17, 18 and 20). The ectoderm (20 μ) is very deeply staining through a layer of small actinopharyngeal glandcells, just below the surface of the ectoderm, while there is a large number of nuclei also in the upper two thirds of the

ectoderm. There are other, less deeply staining glandcells of a larger type, and some small hyaline ones also. The peripheric layer shows its small glandcells best in tangential sections. The nervous layer is well developed, separated from the mesogloea by an open space; the nuclei of this layer are the same as those at a higher level. — The mesogloea is thin, homogeneous, and thickened in the places where the mesenteries are attached to it (Pl. V, fig. 18). The entoderm (Pl. I, fig. 19) is the same as in the bodywall, but more loosely built, perhaps through the presence of numerous hyaline glandcells. The actinopharyngeal ectoderm is continued lip-wise outside the mouth (Pl. V, fig. 17) while this lip is easily to be distinguished from the actinopharynx by the presence of a limiting groove in the ectoderm and by a mesogloeal lamella between both parts of the ectoderm. The entire oral cone is oblique; in its lower part the actinopharynx descends to the deepest level along the primary transversal mesenteries. The ectoderm is folded deeply, in correspondence with the places of attachment of the mesenteries (Pl. V, fig. 18).

The MESENTERIES have a regular course and structure. The mesogloea is thin and although there are no musclefibres, both sides of the mesenteries are inclined to show a difference of thickness of the entoderm. — There are no ovaria or testes.

MESENTERIAL FILAMENTS are to be found along the primary transversal mesenteries only (Pl. I, fig. 18; Pl. V, figs. 18 and 20). At first they are unbranched (fig. 20), but at a greater distance from the actinopharynx they become branched. They are single-lobed with actinopharyngeal ectodermal structure. The mesenterial mesogloea is narrowed before branching into a fork. The very numerous nuclei form a zone which is clearly limited from the rest of the filament, and which has a somewhat smaller number of nuclei in its periphery. There are some hyaline glandcells together with the small deeply staining peripherical glandcells. I thought I saw some nematocysts in the distal part, but I could get no certainty about this point. There is a nervous layer in the deeper part of the epithelial layer. — There is a great number of yellowish pigment granulae in the nuclear zone, the same as are found in some lower parts of the actinopharynx.

3. *Eucirripathes translucens* v. Pesch.

TENTACLES (Pl. II, figs. 1, 3 and 9). The ectoderm (75—105 μ) is very thick when compared with the bodywall, as is also the case with the other layers. Almost the entire upper half of the ectoderm is filled with deeply staining glandcells. In some places they surround nematocyst-batteries (Pl. II, fig. 1). There is a large accumulation of nuclei below these batteries. The nervous layer is well separated from the mesogloea and there are very slightly developed longitudinal musclefibres, lying against the mesogloea. The mesogloea varies from 140 μ at the tentacular base to 10 μ at the top of the tentacle. Where two lateral tentacles touch each other at the base, a thickness of 500 μ may be met with. — It is a homogeneous layer. Sometimes there is a fibrillar division of the mesogloea; these fibres connect ectoderm and entoderm and the bundles are more branched at the ectodermal side than at the entodermal side (Pl. II, fig. 9). However it is not impossible that we have an artefact here through the

influence of the preservation, etc., although the colouring is everywhere the same, while the peripherical layer of each bundle would be coloured more deeply through greater density, if the fibres had originated through contraction after rupture. — The entodermal side of the mesogloea shows circular ridges (Pl. II, fig. 3), which are especially high in the lower part of the tentacles. Sometimes the bases of these ridges are connected by a fibrillar layer in the mesogloea. These ridges repeatedly consist of narrow bands, pressed together, and which towards the periphery are branched and continued by the epithelial cells. Towards the deeper mesogloeal layers these bands are often continued in the type of bundles of Pl. II, fig. 9. The entoderm varies from 40—150 μ, on the same height in the tentacle. A nervous layer is not to be discerned; there are no musclefibres although the limit of entoderm and mesogloea often colours very deeply. In some places there are small, deeply staining glandcells on a variable depth in the entoderm.

Bodywall (Pl. II, figs. 2 and 4). The layers are very thin, when compared with the tentacles, as will be seen by comparing figs. 1 and 2 on Pl. II, both of which are enlarged to the same degree. The ectoderm (40 μ) has the same structure as in the tentacles but there are no nematocyst-batteries and the number of deeply staining glandcells is smaller, but still large. — The nervous layer is very deeply seated, while musclefibres are absent. — The mesogloea (14 μ) is homogeneous; the entoderm (18 μ) does not contain any glandcells. The nuclei which, just as in the tentacles, are more rounded and less deeply staining than in the ectoderm are found in the peripheric part of the entoderm or in the middle third part. There are a few nuclei only, of the same structure, near the mesogloea (Pl. II, fig. 2). The nervous layer is well developed. Musclefibres are absent. The entoderm shows a deep-brown pigmentation, but only right and left of the place of attachment of the primary transversal mesenteries (Pl. II, fig. 4). This pigment is arranged in regular longitudinal rows in the epithelial cells, especially in the upper part of the entoderm. The same pigment is found in the mesenterial entoderm.

The oral cone (Pl. II, fig. 5) has an ectoderm which varies from 40—105 μ in thickness in the same section, in connection with the position of the lateral tentacles. The thickness is 40 μ where the tentacles touch the oral cone and 105 μ between these places. The glandcells are not so numerous as in the tentacles, and nematocyst-batteries are absent. There are many hyaline glandcells in the lower part of the ectoderm. There is a nervous layer and a layer of well developed but few longitudinal musclefibres, without mesogloeal lamellae. The mesogloea (20—35 μ) is thickest near the mesenteries. The entoderm (13 μ) is rather badly preserved. — The polyps are loosened from the axis so that only part of the axial layers are found. The gastral cavity is a very narrow slit between bodywall and axis-entoderm. Above the spines, the sheath of the spines is often grown together with entoderm and mesoegloea of the bodywall (Pl. V, fig. 26). The axis-ectoderm is thicker at the base of the spines than at the top. The axis-ectoderm as well as the entoderm are a low, cubical epithelium. The ectodermal nuclei have the structure of the normal entodermal type.

Actinopharynx (Pl. II, fig. 5). The oral cone is very high; the actinopharynx is elongated ellipsically in horizontal section. The inner wall is very deeply folded so that the lumen is very much restricted, to a breadth of 40 μ, together with a longest diameter of 150 μ in the upper part of

the oral cone. The ectoderm-folds have no connection with the situation of the mesenteries. The ectoderm is 110 μ, but 26 μ between the folds. At the sagittal ends of the lumen the two folds are shorter with a broader base; there are 4 folds in each half of the actinopharyngeal wall, so ten in all. — Just below the surface there is a great number of actinopharyngeal glandcells and numerous small nuclei. In this deeply staining layer there is a great deal of brown pigment besides. — This pigmentation, which in the upper part of the actinopharynx is only locally crowded and even may be entirely absent, increases in the lower part of the actinopharynx. The free border contains so much pigment as to blacken the folds entirely, which are more numerous here. The nervous layer is well developed and below it there are a number of paired deeply staining stripes, at right angles with the mesogloea. I hold them to be thin mesogloeal lamellae, covered on both sides by a very thin layer of longitudinal musclefibres. The mesogloea is 5 μ; the entoderm is the same as in the oral cone.

Mesenteries. They are normal in number; the primary transversal mesenteries have a very convoluted course. The mesogloea is 5 μ or less in the higher part of the oral cone and slightly more below the free border of the actinopharynx. The entoderm of the primary transversal mesenteries contains pigment, increasing in quantity in the lower parts of the mesentery, especially near the bodywall. There are no musclefibres, while mesogloeal lamellae are absent also.

There are no reproductive organs.

The mesenterial filaments are found along the primary transversal mesenteries; they are very much convoluted and branched. The very thin and fibrillar mesenterial mesogloea is slightly broadened and than immediately branched in a large number of fibres, which diverge right and left towards the most deeply staining parts of the filament. The mesenterial entoderm, which is entirely free from glandcells, surrounds the filament laterally cup-shaped (Pl. II, fig. 6). They are single-lobed. The pigmentation is very strong, especially on the limit against the entoderm. But the periphery of the ectoderm is also pigmentated, although less so; there is some pigment also in the basal part of the epithelial cells. There are some hyaline glandcells at a deep level, but further especially actinopharyngeal glandcells in the superficial layer. There are no nematocysts. — A nervous layer is not to be discerned.

4. *Eucirripathes contorta* v. Pesch.

Tentacles (Pl. III, fig. 3; Pl. V, figs. 1 and 4). The ectoderm is 80 μ at the base of the tentacle and 26 μ at the top. It contains rather numerous deeply staining glandcells, with granular contents, especially in the upper half of the ectoderm. In large parts these cells are less numerous. There are small hyaline glandcells in the lower half of the epithelium. The nematocyst-batteries are to be found only on that side of the tentacle which is directed towards the oral cone, and especially on the lower half of the tentacle. The nervous layer is well developed. There is a very slight layer of longitudinal musclefibres. The mesogloea, 13 μ at the top of the tentacle and 70 μ at the base, has circular ridges on the entodermal side (Pl. V, figs. 1 and 4), especially in the lower half of the tentacle. — The mesogloea contains no oval cells but a large number of very fine fibrillae, which connect in bundles the bases of

entoderm and ectoderm (Pl. III, fig. 3). These fibres are united to a very thin layer on the entodermal side, immediately in contact with the entoderm. These fibres are to be found especially in that part of the tentacle where the tentacular base is attached to the peripheric bodywall. The entoderm (max. 80 μ) has a well-developed nervous layer and a layer of circular musclefibres. The entire epithelium is a little more deeply staining than the ectoderm, but it does not contain any deeply staining glandcells. The nuclei are numerous and small, but they do not stain very deeply.

Bodywall (Pl. II, fig. 10). The ectoderm (60 μ) locally contains a larger or smaller number of deeply staining glandcells, especially in the upper half of the ectoderm. There are large hyaline glandcells besides, over the entire depth of the epithelium. There are no nematocyst-batteries. The mesogloea (15 μ) is homogeneous, without fibres. — The entoderm (30 μ) contains some hyaline glandcells but only very rare deeply staining glandcells. The nervous layer is well developed. — The polyps are separated by an interzooidal septum, the mesogloea of which is very irregular (Pl. V, fig. 6), This septum is fixed to a basal septum, which is a complete septum below the peripheric part of the polyp, but incomplete below the middle of the polyp. Here it is curved back towards the polypar periphery; it passes below a second polyp, at first incomplete, but furtheron as a complete basal septum. In Pl. V, fig. 6 the curve of the septum below a polyp is figured and the partly continuing of it below the second polyp. In fig. 255 the course of the basal septum below two polyps is schematically given in a series of cross-sections through the axis. This basal septum is not to be mixed up with the axis-layers and the connecting septum. The polyps are loosened from the axis so that the axis-layers are lost for the greater part, but part of them is present in the sections, so that a confusion with the basal septum is excluded. In Pl. V, fig. 6 part of the axis-mesogloea and axis-ectoderm is visible; the mesogloea may be fused with the bodywall, as is mentioned in other species, but here it may be fused with the basal septum also (Pl. V, fig. 6 at *d*). The axis-ectoderm is thickest at the base of the spines. — On both sides of the interzooidal septum the mesogloea makes a large number of mesogloeal septa at the entodermal side of the bodywall; this secondary interzooidal septa disappear at a certain distance from the large septum. The entoderm of the bodywall does not follow these secondary mesogloeal septa, but its surface is smooth above the mesogloeal irregularities (Pl. V, fig. 6).

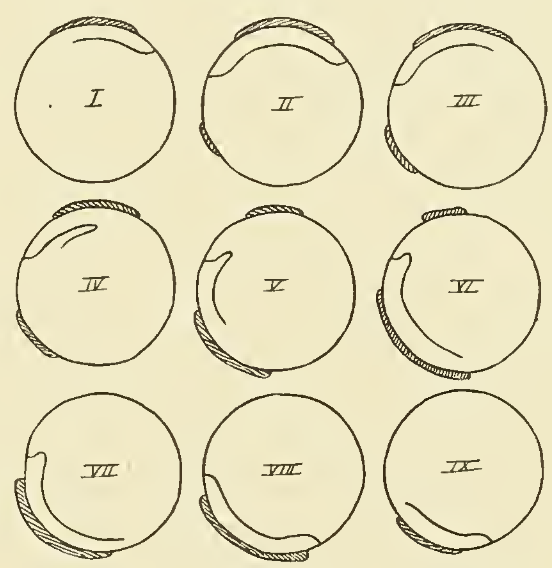

Fig. 255. *Eucirripathes contorta* v. Pesch. Schemata of the interzooidal and the basal septum in succeeding sections. The basal septum, which at first is found below the polypar border (I), extends as a continuous base below the polyp (II), is afterwards unilateral again (III), curves backwards (IV) and makes at first an incomplete base (V, VI, VII), afterwards a complete base (VIII) below a neighbouring polyp; at the polypar limit the septum is incomplete again (IX). The polyps are indicated by thicker parts.

The layers of the oral cone have the structure of the bodywall.

Actinopharynx (Pl. II, fig. 7; Pl. V, figs. 5 and 7). The lumen is a very much sagittally elongated slit, with a longest diameter of 500 μ together with a breadth of 30 μ only. — It does not descend to a very deep level, for at the base of the oral cone its free border is continued into

the mesenterial filaments. The oral cone is inclined distally so that a vertical section attains the actinopharynx obliquely. The ectoderm is very much folded; so its thickness varies from 35 μ—90 μ. There is no connection between the number of folds and the mesenteries; two folds only, one on each sagittal end, are constant. The nervous layer is well developed; the muscular layer contains a few longitudinal fibres only. There are a large number of deeply staining granular glandcells, which very often consist of a peripheric part and a part in the lower epithelial half, both parts connected by a filiform stalk (Pl. II, fig. 7). There are numerous hyaline glandcells at every depth of the ectoderm. The ectodermal surface stains deeply and is vertically striated, sharply limited from the deeper epithelium (Pl. II, fig. 7). This surface-layer is probably formed by bundles of ciliae. There are no nematocysts. The mesogloea, a few μ thick, is somewhat thickened at the places of attachment of the mesenteries. It is a homogeneous layer. The entoderm (55 μ) contains only a few deeply staining glandcells, not granular and less deeply stained than in the ectoderm. The upper part of the actinopharynx is entirely free from pigment, but in the lower part pigmentation appears, increasing in quantity towards the free actinopharyngeal border. This is very obvious in Pl. V, fig. 7 where the section is oblique; in this figure the sagittal part of the actinopharyngeal ectoderm is free from pigment; its quantity increases towards the middle of the figure where a lower part of the actinopharynx is attained.

Mesenteries (Pl. II, figs. 8 and 11; Pl. V, figs. 3, 4, 5, 7 and 24). In the number of mesenteries *Encirripathes contorta* differs from all other described species of this and other genera except the *Enantipathes*-species, which formerly was called *Leiopathes*. There are also typical differences in ovaria and mesenterial filaments, which render this species rather curious.

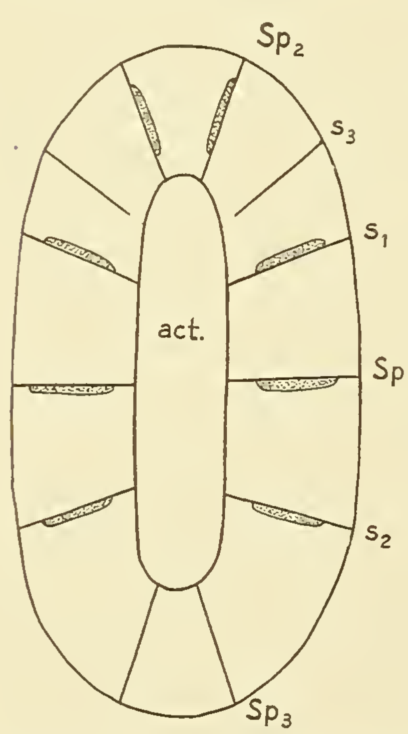

Fig. 256. *Encirripathes contorta* v. Pesch. System of the longitudinal musclefibres on the mesenteries (for the text cf. the list of abbreviations, before the plates).

On a horizontal section of the upper part of the actinopharynx (Pl. V, fig. 5) there are the normal number of the mesenteries visible, like in other species. But halfway down the oral cone an extra pair of secondary mesenteries appears (Pl. V, fig. 7), situated between the normal pair of secondary mesenteries and the primary sagittal mesenteries, while in *Leiopathes* this 6th pair of mesenteries is found by Brook and van Beneden between the normal secondary ones and the primary transversal mesenteries. While all the other pairs of mesenteries reach the actinopharyngeal wall, this is not the case with the sixth pair, which is attached to the bodywall only (!). This sixth pair descends to the same depth as the other secondary mesenteries, even deeper than the primary sagittal mesenteries. — For the greater part the structure of all the mesenteries is the same as elsewhere. But in regularly distributed places the mesogloea bears lamellae of the same type as the lamellae which support the musclefibres in Actinia. Here also these lamellae support a slightly developed system of longitudinal musclefibres. These lamellae are clearly visible in Pl. V, figs. 3 and 24; they are arranged unilaterally on the mesenteries according to the following system (Pl. V, fig. 24; textfig. 256) in all the polyps: on the anterior pair of primary sagittal mesenteries the longitudinal musclefibres are found on

the anterior side; there are no musclefibres on the extra-pair of secondary mesenteries; the fibres are found on the anterior side of the anterior pair of secondary mesenteries and on the posterior side of the other mesenteries. They are absent (or not visible) on the posterior pair of sagittal primary mesenteries. The same system is found in all (4) the polyps of this species but one of the young polyps of Pl. V, fig. 1 had the lamellae on the primary transversal mesenteries on the anterior side of one mesentery and on the posterior side of the other mesentery of the same pair (fig. 258, *1*.) — Through the curving of the oral cone and of the actinopharynx the direction of the mesogloeal lamellae is not to be made out immediately but since they are not visible in cross-sections of the oral cone, and only in oblique sections I am of opinion that these lamellae converge from the free border of the mesentery towards the top of the oral cone; at last they are subparallel with the actinopharyngeal wall, so that the musclefibres, which are found on these lamellae are longitudinal (cf. the schematical fig. 254). The other side of the mesenteries is entirely free from lamellae. — The primary transversal mesenteries with their lower border are fixed to the interzooidal septum, near the polypar limit.

Reproductive organs. Up till now the genital cells of the Antipatharia are found in the primary transversal mesenteries only and never in the other mesenteries. This *Eucirripathes* has well developed ovaria not only in the primary transversal mesenteries but in both anterior pairs of secondary mesenteries also. It is true that these ovaria are especially developed in the primary transversal mesenteries, to such a degree that they are extended S-shaped between bodywall and actinopharynx (Pl. V, fig. 7), but the secondary mesenteries are so much broadened that the entire polyp is divided by the transversal mesenteries in very unequal parts: a large anterior one, and a much smaller posterior part since the posterior secondary mesenteries are sterile and require much less room. This fact, together with the presence of fertile secondary mesenteries, is easily to be distinguished in horizontal sections (Pl. V, fig. 7) as well as in vertical sections (Pl. V, fig. 4). In one polyp there were ova to be seen even in the anterior pair of sagittal mesenteries (Pl. V, fig. 4) but the sections gave no absolute certainty on this head. The ovaria are found in the mesenteries, mentioned above, over their entire length, except in the extreme upper part of the oral cone. The ova do not deviate from those of the former *Eucirripathes*; there is no egg-cone towards the entodermal surface. The mesenterial mesogloea may be followed for a little distance in the ovaria, without forming a clear mesogloeal capsule around the entire ovarium. The mesogloea is dissolved into very fine fibrillae, which surround each ovum with a thin capsule. The larger, ripe ova are found especially in the superficial parts of the ovaria, while the young ova are found in the deeper parts, especially near the visible part of the mesenterial mesogloea. In this case a connection of the egg-capsule with the mesogloea of the mesentery is often visible; usually these young ova are oval in shape, with their pointed side turned towards the mesogloea. The ova are situated unilaterally in the mesenteries; in Pl. V, figs. 4 and 7 this is indicated by the course of the visible part of the mesenterial mesogloea, very near one of the surfaces of the mesentery (fig. 7: s_3 and s_1). The unchanged entoderm-cells contain pigment, but not in very great quantity.

The mesenterial filaments are found not only along the free border of the transversal mesenteries but also along at least either anterior pair of secondary mesenteries, usually the

normal pair, and also along the anterior pair of primary sagittal mesenteries (Pl. V, fig. 7). Between the fertile part of the mesenteries and the mesenterial filaments the mesenteries are almost unchanged; here the mesogloea is somewhat broadened and it contains numerous oval or rounded connective tissue cells, with contracted plasma (Pl. II, fig. 11). These cells are found also in the mesogloea near the mesenterial filaments and in the mesogloea of the interzooidal septum, but in the latter case they are not so very numerous. — The mesogloea of the mesenterial filaments contains the same cells (Pl. II, fig. 8) before bifurcating. This branching is especially conspicuous in the lower part of the filaments along the sagittal mesenteries. They contain a very large quantity of pigment, especially in the lateral parts. The peripheric part contains a few deeply staining glandcells; there are hyaline glandcells in the deeper layers of the ectoderm. Between the mesogloeal fork there is a granular nervous layer. The filaments are very much branched along the primary transversal mesenteries.

The sections reveal also a remarkable mode of growth of polyps by budding, but not, as usually, in the interzooidal areas but on the oral cone (Pl. V, figs. 1 and 2; textfigs. 257, 258). On one and the same oral cone, limited by two large sagittal tentacles (Pl. V, fig. 1) there are three oral slits, of subequal dimensions (fig. 1, at *1*, *2* and *3*). Each mouth has its own actinopharynx and its own system of mesenteries. There are eight lateral tentacles to be found, appertaining to this oral cone. Four of them appertain to polyp *1* and four to polyp *2*, while the third polyp has as yet no lateral tentacles. I can find no more than two sagittal tentacles, mentioned above. — On a little distance from this oral cone, there is a fourth mouth with actinopharynx and mesenteries, near the polypar limit. This young polyp has its own complete set of lateral and sagittal tentacles (fig. 257, *4*). — The free borders of the actinopharynges of the young polyps are united, as will be seen from the pigmentated parts of Pl. V, fig. 1. — In all these young polyps the mesenteries are fertile, especially the primary transversal mesenteries, which bear highly branched mesenterial filaments besides (Pl. V, fig. 2, where the filaments of polyp *1* are figured). Polyp *2* also has ovaria in one pair of secondary mesenteries

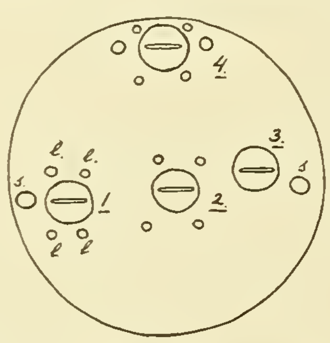

Fig. 257. *Eucirripathes contorta* v. Pesch. Arrangement of the young polyps (schema): *1*, *3*, *4* mouths of the young polyps; *2* mouth of the original polyp, to which both sagittal tentacles appertain (*s.*) and four lateral tentacles; 4 has a complete set of tentacles, 1 has lateral ones only (*l*) and *3* none at all.

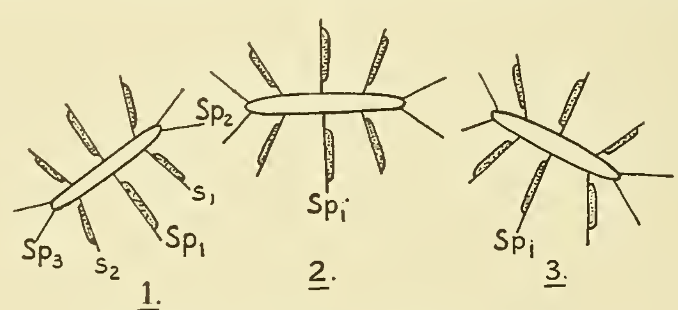

Fig. 258. *Eucirripathes contorta* v. Pesch. Longitudinal musclefibres on the mesenteries of polyps 1, 2 and 3 out of fig. 257 (for the text cf. the list of abbreviations before the plates).

and since the ovaria in this polyp are the best developed, it gives the impression of being the oldest polyp, presumably the original polyp, to which the large sagittal tentacles belong, and on the sides of the oral cone of which the polyps *1* and *3* have originated, and polyp 4 furtheron on the bodywall. — The system of longitudinal musclefibres on the mesenteries is

given in fig. 258. The system is the same as in the adult polyps; the primary transversal mesenteries of polyp *1* slightly diverge from the normal type, as is described above (fig. 258 at *1*).

PARASITES. There are a few symbiotic Algae in the entoderm of the mesenteries near the mesenterial filaments. In some places the lower half of the ectoderm of the tentacles contains deeply staining parasites, one of which is figured in Pl. III, fig. 3. They are almost globular, with a granular protoplasma, enclosed in a larger cavity, on all sides surrounded by the ectoderm, and very near the mesogloea. A nucleus is not to be discerned. I consider it as a unicellular parasite.

5. *Eucirripathes spiralis* (Blainv.) v. P. var. *aphanipathoides* v. Pesch.

TENTACLES. The ectoderm (30—55 μ) contains two types of deeply staining glandcells. Together with very numerous, large, homogeneous, not very deeply staining glandcells, there are less numerous, very deeply staining glandcells, especially surrounding the nematocyst-batteries. These batteries are numerous and not restricted to special ectodermal papillae. The ectoderm contains a large number of somewhat elongated nuclei. The nervous layer is well developed, almost in contact with the mesogloea. There are hardly any musclefibres. The mesogloea varies from 20 μ at the tentacular base to a few μ at its top. It is a homogeneous layer, with, in some places, very fine fibrillar connections between ectoderm and entoderm; these fibrillae are collected in bundles, diverging from the base of one or several epithelial cells. The entoderm (max. 30 μ) has no muscular layer, while a nervous layer could not be discerned with certainty. There are hardly any glandcells. The nuclei are less numerous than in the ectoderm, more rounded and less deeply staining.

BODYWALL (Pl. III, fig. 1). The ectoderm has the same thickness and structure as the tentacular ectoderm. The very deeply staining glandcells are absent, together with the nematocyst-batteries, but the lighter-staining glandcells are very numerous and form a continuous mass over large distances. The mesogloea (13 μ) and the entoderm (28 μ) are the same as in the tentacles.

The ORAL CONE has ectoderm, which is thicker than in the bodywall and exceedingly rich in glandcells. There are nematocyst-batteries also. — The polyps are separated by an interzooidal septum (Pl. V, fig. 22), with a depth of 150 μ. The axis-epithelium is lost for the greater part. In some places the sheath around the spines is fused with the bodywall. The axis-ectoderm is of the same structure as the entoderm of the bodywall. The spines project rather far into the polyps; in Pl. V, fig. 22 the sheath of such a spine is found at a very high level in the actinopharyngeal lumen; the mesogloea is very thin.

ACTINOPHARYNX. (Pl. III, fig. 1). The ectoderm varies to max. 50 μ. It contains small actinopharyngeal glandcells, but in a not very large number. The ectoderm stains very deeply, principally through the large number of nuclei. The mesogloea is 5 μ or less, and homogeneous in structure. The entoderm (14 μ) is the same as in the bodywall. There is no pigmentation in the ectoderm, neither in the upper part of the actinopharynx nor in its lower part near the free border.

Mesenteries. They are normal in number and structure. The primary transversal mesenteries contain ovaria (Pl. V, fig. 22). — The mesenterial mesogloea makes no capsule around the ovaria, but is entirely dissolved; in Pl. V, fig. 22 the mesogloea is clearly visible since this section attains the mesentery above the fertile part.

The mesenterial filaments are found along the primary transversal mesenteries only, but they are of no great importance, and they consist in a very short continuation of the actinopharyngeal ectoderm along the free mesenterial border. Pigmentation is entirely absent.

6. *Eucirripathes spiralis* (Blainv.) v. P. var. *striata* v. Pesch.

Tentacles (Pl. III, fig. 5). The ectoderm (26 μ) contains very deeply staining glandcells, which are only locally crowded and which never form a continuous mass, as in var. *aphanipathoides*. They are found especially in the upper half of the ectoderm, surrounding the nematocyst-batteries. A nervous layer is not to be discerned. There is a layer of longitudinal musclefibres against the mesogloea. The mesogloea (a few μ—26 μ) contains a large number of fine fibrillae, which do not always connect the ectoderm and the entoderm in a regular manner, but they may be rather irregular also, so that the ectodermal or entodermal beginning is easily to be distinguished, while the other end seems to finish freely in the mesogloeal mass (Pl. III, fig. 5). The entodermal side of the mesogloea shows circular ridges, especially near the tentacular base. The entoderm (26 μ) has a layer of circular musclefibres lying against the sides of the mesogloeal ridges (Pl. III, fig. 5); there is no nervous layer. The entoderm contains a few deeply staining granular glandcells at various levels. There is also a brown pigment in some places, especially near the surface.

Bodywall. The ectoderm (13 μ) has the same structure as in the tentacles minus the batteries of nematocysts. The glandcells are sometimes of the lighter type as is found in the ectoderm of var. *aphanipathoides*. There are no musclefibres. The mesogloea (5 μ) contains the same fibrillae as in the tentacles in all directions. The entoderm (13 μ) has only very sparingly distributed glandcells. The superficial layer is often filled with brown pigment, but not regularly everywhere (Pl. III, fig. 10). The layers of the oral cone are thicker, more in concordance with the tentacles (Pl. III, fig. 10). — There is an interzooidal septum, which is not necessarily at right angles with the colony-axis.

The axis-epithelium is lost; the short connecting septum only is partly there. This septum is not always found diametrically opposite the polypar mouth.

Actinopharynx (Pl. III, fig. 10). The ectoderm (50—60 μ) does not show a nervous or a muscular layer. The superficial layer of the epithelium contains numerous small actinopharyngeal glandcells. — This ectoderm is continued lip-wise outside the mouth, easily to be distinguished from the ectoderm of the bodywall, which contains less deeply staining elements. — There is no pigmentation even in the lower part of the actinopharynx. The ectoderm is somewhat folded, not corresponding with the places of attachment of the mesenteries; at the sagittal ends the ectoderm is less thick, but still of the same structure. The mesogloea (a few μ) is homogeneous. The entoderm is 20 μ or less. It contains hardly any glandcells, so that

the entoderm is clearly limited against the ectoderm at the free actinopharyngeal border. Halfway down the actinopharynx the entoderm contains a very thin layer of circular musclefibres. There is no pigmentation.

Mesenteries. They are normal in number, course and structure. In some places the primary transversal mesenteries contain unilateral mesogloeal lamellae, visible in somewhat oblique horizontal sections. They are always without musclefibres.

Mesenterial filaments occur along the primary transversal mesenteries, but also along the primary sagittal ones. The former are very much branched and convoluted. They contain darkbrown pigment, but in a small quantity only; the glandcells are the same as in the actinopharynx.

Parasites. There are symbiotic Algae in the entoderm of the tentacles and the bodywall. They are brown, rounded or pearshaped, with a diameter of 7 μ.

Together with a great uniformity in many regards, the examination of both varieties of *Eucirripathes spiralis* shows differences in anatomical structure, although of no very great importance. As was not expected, the thickness of the various layers is greater in var. *aphanipathoides* than in var. *striata*, especially in the bodywall, although in the latter variety the polyps give an impression of being much larger and more heavily built (cf. the systematic part). The ectoderm differs in deeply staining glandcells, which are of two types in var. *aphanipathoides*, the more deeply staining one of which only is present in var. *striata*. Var. *aphanipathoides* has a larger number of glandcells in the oral cone, while var. *striata* has a bodywall and oral cone, which are similar in this respect.

The entoderm contains more glandcells in var. *striata* than in var. *aphanipathoides* where they are almost absent; var. *striata* only has an entodermal muscular system and some symbiotic Algae, while a brown pigmentation occurs in some places in var. *striata* only.

The actinopharynx is more heavily built in var. *striata*; var. *aphanipathoides* misses the slight musclefibres and the slight pigmentation of var. *striata*.

The mesenteries of var. *striata* have mesogloeal lamellae and a more developed system of mesenterial filaments, even along the sagittal mesenteries, than var. *aphanipathoides*. Var. *striata* has some pigment in the filaments, but the other variety not. — Generally var. *striata* is richer in glandular elements and pigment with a beginning of a muscular system.

7. *Eucirripathes musculosa* v. Pesch.

Tentacles. The ectoderm (26 μ) has almost entirely disappeared. The remaining part contains only a few deeply staining glandcells or none at all. There are nematocyst-batteries. There is a thin layer of longitudinal musclefibres against the mesogloea. The mesogloea (5—10 μ) is a homogeneous layer, with very rare transversal fibres but without any cells. The entoderm (20—26 μ) has only rare deeply staining glandcells. There is a very slight layer of circular musclefibres.

Bodywall (Pl. III, figs. 4, 7 and 9). The ectoderm (33 μ) has local crowdings of deeply staining glandcells (Pl. III, fig. 4) but never to such a degree as to form a continuous mass. There is a slightly developed layer of musclefibres, directed from the polypar base towards

the mouth (Pl. III, fig. 7). The mesogloea (6—20 μ) is a homogeneous layer. The entoderm (max. 33 μ) has the same structure as in the tentacles.

The ORAL CONE, which is high and cylindrical (Pl. V, fig. 8) has nematocyst-batteries in its ectoderm; these batteries are not surrounded by glandcells. Its entoderm contains a layer of circular musclefibres. The oral cone is constricted at its base, below the free border of the actinopharynx but above the base of the sagittal tentacles. In Pl. V, fig. 9 the section through the bodywall attains the higher, bulging part of the oral cone.

The AXIS-layers have disappeared, except the connecting septum, which is short.

The ACTINOPHARYNX (Pl. III, figs. 6, 7 and 9; Pl. V, fig. 8) has a folded ectoderm (40 μ); the folds do not correspond with the places of attachment of the mesenteries. The folds increase in number in the lower part of the actinopharynx. The ectoderm contains a superficial layer of actinopharyngeal glandcells. A layer of musclefibres is usually absent but in some places the ectodermal limit of the mesogloea stains very deeply, which is very like a thin layer of musclefibres (Pl. III, fig. 7). Their direction is not to be distinguished, but probably they are longitudinal ones, since musclefibres are more easily to be distinguished in cross-sections than in longitudinal sections. The ectoderm contains darkbrown pigment, which increases in quantity in the lower parts of the actinopharynx. The mesogloea (5—14 μ) is a homogeneous layer, increasing in thickness at the places of attachment of the mesenteries. The entoderm (25 μ) contains no deeply staining glandcells and no pigment. There is a distinct layer of slightly developed circular musclefibres (Pl. III, fig. 9), which are more crowded than the circular fibres in the entoderm of the oral cone. — The actinopharyngeal lumen, which is a slit in its upper part, is more rounded in its lower part, and the actinopharyngeal wall is curved towards the wall of the oral cone. The actinopharynx descends no deeper than halfway the oral cone (Pl. V, fig. 8), except along the sagittal mesenteries where it descends to a much lower level, so that the actinopharyngeal wall is a semi-circle in a vertical cross-section of the polyp.

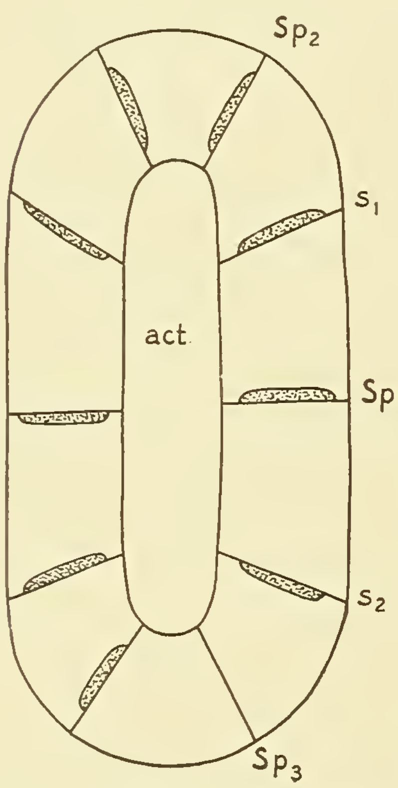

Fig 259. *Eucirripathes musculosa* v. Pesch. System of the longitudinal musclefibres on the mesenteries (for the text cf. the list of abbreviations before the plates).

MESENTERIES (Pl. III, figs. 4, 6, 7 and 8; Pl. V, figs. 8 and 9). — They are normal in number. Their musclesystem is apparently very divergent. The mesenteries have unilateral mesogloeal lamellae, which bear well developed musclefibres, often arranged along small secondary lamellae. The system of longitudinal musclefibres is figured in the textfigure 259. On one pair of sagittal mesenteries these fibres are found on the sides facing each other, while on the other pair of sagittal ones these fibres are probably found on the averted sides, at least on one of these mesenteries with certainty. The lamellae on the other mesenteries are arranged in an entirely different system in both halves of the polyp. In one half they are on those sides of the secondary mesenteries, which are averted from the transversal primary ones (Pl. III, fig. 7), while in the other half they are turned towards the primary transversal

mesenteries (fig. 259 to the left). On these transversal mesenteries the longitudinal musclefibres are found on the anterior side in one half of the polyp and on the posterior side in the other half. — This musclesystem on the primary transversal mesenteries is the same as in one of the young polyps of *Eucirripathes contorta*, but this young polyp has the same system on its secondary mesenteries in both polypar halves. — In an other series of sections I find in both halves of the polyp the same system of musclefibres; both halves have the system which is figured in the right half of fig. 259, but the fibres on the sagittal mesenteries could not be observed. — It is not unlikely that the system of fig. 259 is a combination of the longitudinal system and the transversal musclefibres, since the direction of both systems is very much influenced by the curving of the oral cone and the actinopharynx, as is described and figured in fig. 254. The fact that the horizontal sections are somewhat oblique makes it possible that the fibres which I observed were not all of them longitudinal ones. The right half of fig. 259 gives the situation in a somewhat higher part of the oral cone than the left half; so the right half represents without doubt the longitudinal fibres, but the left half may give the transversal fibres. One of the exceptions, which remain, are the fibres on the left sagittal mesentery (Sp_2), which ought to have the fibres, if they were transversal ones, on the averted side. But the sagittal mesenteries are so very near each other and the obliqueness of the section is of so little importance on this side that we may consider the fibres on both sagittal mesenteries as longitudinal ones. — The only exception, which remains, is the position of the longitudinal fibres on one of the other pair of sagittal mesenteries, but since the section is in this part more oblique through a contortion of the polyp it is always possible that we have transversal musclefibres here. However this point is not to be decided with certainty since the other sagittal mesentery of this pair does not show any trace of musclefibres. — I am of opinion that after all the mesenterial musclesystem of this species is the same as in *Eucirripathes anguina* a. o. — The mistaking of transversal musclefibres for longitudinal ones is the more possible in this species since the transversal fibres are highly developed, although it is true that they are not so strong as the longitudinal fibres; their mesogloeal lamellae are rather low (Pl. III, fig. 8). In vertical sections the mesenteries, which follow the downward and outward curve of the actinopharynx, are attained lengthwise in the upper part of the oral cone, but obliquely or even cross-wise in the lower part of the oral cone. In Pl. V, fig. 8 the oral cone is figured in vertical cross-section but the actinopharyngeal wall is curved so much that it is attained obliquely. The primary transversal mesentery out of this figure is figured in Pl. III, fig. 8 also; at the side of the top of the oral cone this mesentery is attained lengthwise so that the transversal musclefibres are visible in cross-section (*tr. sp.*), while at the side of the actinopharynx the longitudinal fibres are attained in cross-section and so they are visible in their turn. The longitudinal section of both layers of fibres is never clearly visible; at the utmost the dark limits of the mesogloea are a sign of their presence. — In this fig. 8 on Pl. III the mesogloeal lamellae for the longitudinal musclefibres are the longest. — These transversal fibres were found also on the other mesenteries, but not so highly developed. — Generally the entire musclesystem is strongest on the transversal mesenteries; they are somewhat less developed on the secondary mesenteries, while they are very slightly developed on the sagittal mesenteries (Pl. III, figs. 6 and 7).

On those parts of the transversal mesenteries, the free border of which bears the mesenterial filaments, the musclefibres are on both sides of the mesentery parallel one with the other (Pl. III, fig. 4, which is part of the mesentery from Pl. V, fig. 9, in the left part of the gastral cavity). This is to be explained by the longitudinal musclefibres diverging fan-shaped from the oral one, while the transversal musclefibres retain the same direction everywhere.

The MESENTERIAL FILAMENTS are single-lobed. They have the structure of the actinopharyngeal entoderm with a very large quantity of pigment (Pl. V, figs. 8 and 9). This pigment is very dense on the limit of the ectoderm and the mesenterial entoderm. The filaments are found along the primary mesenteries. They are straight and unbranched along the sagittal mesenteries and very much convoluted along the transversal mesenteries, but only in that part, which immediately follows the free actinopharyngeal border (Pl. V, fig. 8), while they are straighter furtheron in the gastral cavity. In Pl. V, fig. 9 this difference is visible, where the filaments are folded in the oral cone but unbranched and straight in the gastral part. — The secondary mesenteries do not descend so very low into the oral cone, and they have left the actinopharynx long before the free border of the actinopharynx is formed.

8. *Eucirripathes Rumphii* v. Pesch.

TENTACLES (Pl. IV, figs. 5 and 6; Pl. V, fig. 25). The ectoderm (115 μ) contains no deeply staining glandcells or a few only; there are rather a great deal of hyaline glandcells, although less than in the other parts of the polyp. The nematocyst-batteries are very numerous; they are so much crowded that there is hardly any room left for the other epithelial cells, especially at the surface of the ectoderm; at their base there is more room since the batteries are conical (Pl. IV, fig. 6). In Pl. V, fig. 25 I have indicated, with a schematical cross-section through the tentacular top, how numerous, but also how large these batteries are. Their normal type is given in Pl. IV, fig. 6. There are two types of nematocysts. One type is narrow (3 μ) and colourless, with an easily distinguished spiral. This type is the same as is found in all the other species I have examined. The second type is found in this species only. They are yellow in colour, and 5 μ thick. The spiral is not visible or only very indistinct, while there is a narrow longitudinal canal in the nematocyst. Both types are subequal in length, but the yellow ones may be somewhat shorter. Besides they are more brittle, since there are a great many broken yellow nematocysts in the sections, while this is not the case with the normal nematocysts. The yellow nematocysts are more numerous in the batteries on that side of the tentacles, which is averted from the oral cone, although they are not entirely absent in the batteries on the oral side of the tentacles. This is in accordance with the numerous darker points on one side of the tentacles, as is described in the systematic part. The difference between the two types is very conspicuous on a tangential section of the tentacles (Pl. IV, fig. 5). — The batteries are surrounded by hyaline glandcells but not by deeply staining ones (Pl. IV, fig. 6). There are very crowded nuclei below the nematocysts; these nuclei are also visible where a battery is attained in a lower part (Pl. IV, fig. 5 to the right!). — The nervous layer is separated from the mesogloea by a little distance only.

The muscular layer is usually absent; in some places there are musclefibres, very few in number, but much thicker than in other species. The mesogloea ($7\ \mu$) is very thin, when compared with the ectoderm and the entoderm and the heavy structure of the entire polyp. This layer is fibrillar through the basal ends of the epithelial cells. There are no connective tissue cells (Pl. IV, fig. 6). The entoderm ($55\ \mu$) does not contain any deeply staining glandcells, but very numerous hyaline ones. The structure of the entoderm is very much like the ectoderm, except for the absence of batteries and musclefibres.

Bodywall (Pl. IV, fig. 3). The ectoderm ($110\ \mu$) does not contain any nematocyst-batteries, except on the oral cone. There is no layer of musclefibres. The nervous layer is found at a higher level in the entoderm than in the tentacles. There are no deeply staining glandcells or only a few. The hyaline glandcells are very numerous. In front of the connecting septum there is a group of nuclei, deep in the entoderm, below the nervous layer (Pl. IV, fig. 3). The mesogloea ($7\ \mu$) is a homogeneous layer. The entoderm ($40\ \mu$) has the same structure as elsewhere.

The axis-layers have almost entirely disappeared, since the polyps are loosened from the axis. The connecting septum remains with parts of the axis-layers (Pl. IV, fig. 3). The axis-entoderm ($13\ \mu$) is rather thin with the rounded entodermal type of nuclei. The mesogloea is only a few μ thick; the mesogloea of the connecting septum is much broadened at the side of the axis and it contains a large number of cells. These cells are oval shaped or irregularly rounded, but never stellate.

Actinopharynx. The mesogloea and the entoderm are the same in structure and have the same thickness as in the bodywall. The entoderm contains numerous actinopharyngeal glandcells in a superficial layer. The structure of these glandcells is visible in Pl. IV, fig. 1 (mesenterial filament). Each cell is filiform, but near the entodermal surface the cell is swollen and granular, which part is the only visible part at a low magnification. The actinopharynx contains no pigment. The entoderm is folded; these folds concur with the interstices between the places of attachment of the mesenteries.

Mesenteries (Pl. IV, figs. 1, 2 and 4). They are normal in number and course. The mesogloea is very thin; the entoderm is the same as in the bodywall. There is no mesenterial musclesystem; mesogloeal lamellae are entirely absent.

Reproductive organs. There are testes in the primary transversal mesenteries (Pl. IV, figs. 2 and 4). Each testes-follicle is enclosed in a thickwalled mesogloeal capsule, which separates the folliculi one from the other and from the surrounding entoderm. There are young follicles with spermatocytes only, but also ripe testes with bundles of spermatozoa. The diameter of a follicle is $55\ \mu$. The young testes are found in the middle of the mesentery, but the ripe ones are found near the entodermal surface. In this case the mesogloeal capsule-wall is reduced in thickness and the bundle of spermatozoa is turned with its tails towards the entodermal surface. In some cases I saw the spermatozoa being liberated into the gastral cavity through the rupture of the epithelium. I saw no very young follicles with spermatogonia, still without mesogloeal capsule, unless the rounded cells, which I have figured in the mesenterial entoderm, near the mesenterial filaments (Pl. IV, fig. 1), are to be considered as such.

Usually these cells are lying very deep in the entoderm, against the mesogloea, but they are found also at a more superficial level.

Mesenterial filaments (Pl. IV, fig. 1). They are found along the primary transversal mesenteries only; they are convoluted. Their structure is the same as that of the actinopharyngeal ectoderm. The actinopharyngeal type of glandcells makes it possible to discern the limit of the filaments against the mesenterial entoderm, although there is no pigmentation, which gives the sharp limit in other cases. The deeply staining glandcells are more rare in the lateral parts of the filament, which is separated from the mesentery by a constriction. There are numerous hyaline glandcells besides, but no nematocysts. The mesenterial mesogloea at the base of the filament is dissolved into fine fibrillae. A fine granular nervous layer is found between these fibres. There are some spindle-shaped cells with rounded nuclei, in the base of the epithelium. These cells are surrounded by a sort capsule.

9. *Hillopathes ramosa* (v. Pesch).

Tentacles. The ectoderm (55 μ) contains deeply staining glandcells, which are principally found around the conical nematocyst-batteries. The nervous layer is well developed but musclefibres are absent. In its thinner part the mesogloea (2—5 μ) shows no homogeneous layer between the bases of ectoderm and entoderm. The thicker parts are homogeneous, and the mesogloea does not contain cells, but there are bundles of very thin transversal fibrillae, connecting ectoderm and entoderm, at the base of the tentacles, near the transition into the peripheric bodywall. The entoderm (65 μ) contains a large quantity of colourless symbiotic Algae, very much crowded together, especially in the superficial epithelial layer. Their diameter is 5—7 μ. — There are no musclefibres.

Bodywall (Pl. III, fig. 2). The ectoderm (30 μ) contains deeply staining glandcells, but no nematocysts. There is no muscular layer. The mesogloea varies in thickness from a few μ to 13 μ; it is a homogeneous layer. While the ectodermal side of the mesogloea is not very irregular, the entodermal side has formed an interzooidal septum (130 μ deep), covered with entoderm and broadened at is free border. Right and left of this complete septum are found a large number of incomplete septa, but only as more or less high excrescences of the mesogloea; the entodermal surface remains straight (Pl. III, fig. 2). The entoderm is the same as in the tentacles. The deeply staining blepharoplasts in the superficial layer are to be distinguished, as well as the cilia in many places.

The axis-epithelium is entirely lost by the removal of the polyps from the axis. In some places the bodywall is slightly elevated. Here the entoderm is thinner and a second mesogloeal layer is grown together with that of the bodywall. Probably these places are fusions between the sheath of the spines and the bodywall. The axis-ectoderm is thicker at the base of the spines.

The actinopharynx is rather short since there is only a very low oral cone. It has a sagittally elongated slit-like lumen, 13 μ broad with a long axis of 900 μ. The ectoderm (25—35 μ) contains only a few deeply staining glandcells. Pigmentation is entirely absent. The nervous layer is well developed. The mesogloea (max. 2 μ) is sinuous, approaching the

bodywall between the succeeding mesenteries. The ectoderm follows these curves regularly. The entoderm (25 μ) is the same as elsewhere.

Mesenteries. They are normal in number and course. A mesenterial musclesystem is entirely absent as well as mesogloeal lamellae.

Singe-lobed mesenterial filaments are found along the primary transveral mesenteries only. They have the structure of the actinopharyngeal ectoderm. A pigmentation is also absent here.

I have examined some parts of the polyps with reagentia macroscopically on cellulose-reaction, with regard to the large quantity of Algae, but there was no perceptible difference between these polyps and polyps of other species treated in the same manner.

10. *Sibopathes gephura* sp. n. (Pl. VI, figs. 3, 5, 6, 9, 15; Pl. VII, fig. 3).

Tentacles. They are, in cross-section, very elongated in the direction of the colony-axis, Ectoderm. This layer, 55 μ thick, contains many ciliated epithelial cells and only a few glandcells. The nematocyst-batteries are found not only on the top of the not very promiment and so not very conspicuous papillae, but also in the grooves between these papillae. These batteries are not surrounded by deeply staining glandcells, or only by a few small ones in the uppermost part of the epithelial layer (cf. Pl. VI, figs. 3 and 6). There are no other deeply staining glandcells. — The nervous layer is well developed and it is found deep in the ectoderm. There are no ectodermal musclefibres.

Mesogloea. Its thickness is 7 μ near the base of the tentacles; this value diminishes gradually towards the apex of the tentacles, till practically ecto- and entoderm touch each other, without an intervening mesogloea; the basal parts of both layers show only an intermingling of fibres (Pl. VI, fig. 15). — A great number of oval cells are found; these cells are of ectodermal origin, for the same type of cells is present in the base of the ectoderm, while often a cell lies partly in the mesogloea and partly in the ectoderm; also the cell may be connected with the ectoderm by a canal through the mesogloea (Pl. VII, fig. 3, at *).

Entoderm. The structure is not very clear through bad preservation of this layer; therefore I have not always figured the limit of the entoderm, i. a. in Pl. VI, figs. 9 and 15 between the entoderm of the transversal mesenteries and that of the tentacles. — Even the thickness can not be exactly given, since the entoderm fills all the cavities; there is hardly any gastral cavity. Usually the layers become loose and larger by maceration, so that the normal thickness of the entoderm will be less than 40 μ. With certainty are found: many large, deeply staining glandcells (Pl. VI, figs. 3 and 6), greater in number than the ectodermal glandcells or at least greater in total volume. These glandcells lie deep in the entoderm, often touching the mesogloea.

Bodywall. The layers are resp. 33 μ, 10 μ and 12(?) μ thick. Their structure is in every respect the same as in the tentacles but the number of nematocyst-batteries is less, while great parts of the ectoderm may be entirely devoid of deeply staining glandcells. — The mesogloea is very variable in thickness. — The polyps are separated by an interzooidal

septum, the lower part of which is concrescent with the axis-epithelium; there are no peristomal folds between the three parts of the polyp.

The ORAL CONE is high and may be somewhat widened at the mouth. Its ectoderm (55 μ) is in every respect the same as in the tentacles; the mesogloea, 6 μ at the base of the cone, diminishes towards the top to the same degree as in the tentacles; often the shape of the oral cone is in the sections very much like that of a tentacle, open at its apex. — The entoderm (40 μ?) is also the same as in other parts, but with a somewhat greater number of large deeply staining glandcells; however this is not necessary the case (Pl. VI, figs. 3, 6). The uppermost layer of the entoderm has a greater number of nuclei so that here the colouring is deeper (Pl. VI, fig. 6). The limit between the ectoderm and the entoderm at the top of the oral cone is clearly visible, since the entoderm is macerated and the ectoderm not; this limit is a dotted line in Pl. VI, fig. 3 indicated by an asterisk. — The mesogloea is slightly dentate at the entodermal side as if there was an entodermal system of circular musclefibres.

The ACTINOPHARYNX is entirely absent! Perhaps for this reason the number of large deeply staining glandcells is greater and they are found everywhere in the entoderm.

The AXIS has a wall of 36 μ thick with a diameter of the lumen of 100 μ; the spines project as blunt knobs 33 μ above the axis; on some places the axis contains concentric loose rings or rather cylinders, within the solid wall. — From the epithelial layers the ectoderm is 10 μ or less, the mesogloea usually 2 μ, but sometimes increasing to 7 μ, the entoderm 10 μ (?). The mesogloea contains cells and the entoderm has the large type of deeply staining glandcells, though not in a great number (Pl. VI, fig. 6). The connecting septum between axis and bodywall is broad and contains a great number of oval connective tissue cells; the neighbouring mesogloea of the axis diminishes very gradually in thickness, so that sometimes the septum is more like a broad fusion of the axis-epithelium and the bodywall (Pl. VI, fig. 15). There are fusions between the sheath of tissue round the spines, and the bodywall. Sometimes there is hardly any gastral cavity, since over the entire circumference the axis-entoderm and that of the bodywall touch each other. The ectoderm of the axis becomes a higher cylindrical epithelium as it approaches the top of the colony (Pl. VI, fig. 6).

MESENTERIES. There are no secondary mesenteries. The primary mesenteries are not highly developed; the two pairs of sagittal ones are only very narrow projections at the base of the tentacles; in a young polyp they are practically invisible. The mesogloea-projection is not much longer than the thickness of the tentacular mesogloea. These sagittal mesenteries are not very long; their upper and their lower parts become narrower, since there is no actinopharynx to which they can be fixed. The primary transversal mesenteries begin at the distal and proximal ends of the mouth-slit, at first very narrow, furtheron somewhat broader, but not much. They disappear entirely at the depression between the sagittal and lateral parts of the polyp, so that a section through this depression is in every respect like a section through a part of the colony between two polyps, except that there is no interzooidal septum. Only in a young polyp I could follow these mesenteries as very narrow projections in these parts. — The transversal mesenteries appear again in the lateral parts of the polyp; here they are convoluted to a high degree (Pl. VI, fig. 5) while their free border is club-shaped in section.

This swollen border increases continually till it takes up half the breadth of the mesentery. In this swelling the mesogloea contains a great number of oval cells (one of them is white in Pl. VI, fig. 5). The normal mesogloea of the mesenteries is less than 1 μ in thickness. The transversal mesenteries are very thin when you compare them with the mesogloea of the lateral tentacles in Pl. VI, figs. 5 and 9.

Mesenterial filaments are entirely lacking, as is natural since there is no actinopharynx.

Reproductive organs. There are ova present, only in the transversal mesenteries. Each ovum is surrounded by a mesogloeal sheath; the thickness of this capsule is only 3 μ with the ripe ova, but 7 μ with the younger ones (Pl. VI, figs. 9 and 15). The diameter of the ripe ova is 200 μ; one single ovum may fill the entire lumen in a section of the polyp, at least near the top of the colony. The nucleus is large with a round, finely granulated nucleolus. Since there is usually hardly any gastral cavity the ova are found in the lumen of the tentacles, always in one of them, so that one of the tentacles is very much swollen (Pl. VI, fig. 15) and the polyp is asymmetrical. The ova are found behind each other in a longitudinal row in the swollen border of the mesenteries, so that the narrow part of the mesentery is always clearly visible above the ova. — Sometimes two or three ova are found in the same section (Pl. VI, fig. 15), but then they are lying beneath each other in the mesentery, which is curved towards one side in the base of the tentacle. The capsule of the ovum, or, when there are more ova present, of the ovum which is nearest the free border of the mesentery, may be fixed to the mesogloea and the entoderm of the tentacles or the bodywall. Very likely the ova are liberated by the bursting of the capsule, for repeatedly empty capsules are found with collapsed walls (Pl. VI, fig. 9, indicated by an asterisk). They are connected with the neighbouring ovarial capsule (in fig. 9 this connection is not attained by the section). — The ovum does not fill the entire lumen of the capsule, but perhaps the preservation has caused a contraction of the ovum. There is nothing to be seen of the enclosing of the ova in their capsule; the propensity for filling only one tentacle is an indication of a unilateral forming of the ova, so that the mesentery is lop-sided.

The described species is very primitive in structure, as is apparent from its having no actinopharynx, many large deeply staining glandcells in the entire entoderm instead of a concentration of them in an actinopharynx, no secondary mesenteries, only very narrow primary mesenteries, no mesenterial filaments; perhaps the very unimportant mesogloea may also be reckoned as a primitive character, just like the very broad connection between the axis-epithelium and the bodywall.

11. *Schizopathes affinis* (Br.) emend. (Pl. VI, figs. 1, 14 and 16).

Tentacles. The ectoderm, 55 μ thick, has nematocyst-batteries, which extend almost to the base of the ectodermal layer; they are surrounded by homogeneously deeply staining glandcells, which are also rather high. The nervous layer is not very well visible, while muscle-fibres are entirely absent. The mesogloea, 7 μ thick, is homogeneous; very rarely some oval cells occur. In some places the mesogloea is fibrillose, but these fibres are parallel with

the base of ecto- and entoderm. On the entodermal side the mesogloea is very sinuous with large circular ridges, broadened at their tops and bearing secondary ridges here. The entoderm, 40 μ thick, has no deeply staining glandcells. The musclefibres are absent; the preservation is not very good, as is also the case with the ectoderm.

Bodywall. The ectoderm, 40 μ thick, has the same structure as in the tentacles; its thickness varies according to the thickness of the mesogloea (Pl. VI, fig. 1). In front of the connecting septum the ectoderm suddenly diminishes into a very thin layer in the groove of the mesogloea. The mesogloea is 33 μ thick in the neighbourhood of the axis, but at a greater distance from this the thickness diminishes, with frequent slight increasings on the ectodermal side (Pl. VI, fig. 1), to 7 μ in the neighbourhood of the tentacles; this is just the reverse of the condition in other genera, where the mesogloea of the tentacles is always much larger here than in the bodywall. The mesogloea is smooth on the entodermal side; it is homogeneous with some oval cells; usually there is a layer of fibres parallel with the ectodermal base, and nearer to the entodermal side; this layer does not follow the curves on the ectodermal side. The entoderm, 40 μ thick, is the same as in the tentacles.

The oral cone, which may be constricted at its base, has the same anatomical structure as the described parts; only in the lateral walls the mesogloea is thicker (13 μ) than in other places; there are no curves on the ectodermal side.

The axis, the lumen of which has a diameter of 280 μ with a wall of 26 μ (170 μ and 10 μ at the top of the branch) has a fibrillose intima; the spines (30 μ) are shut at their base and solid. The axis-ectoderm is max. 12 μ, the entoderm 20 μ, while the mesogloea is 20 μ, which is rather a great deal compared with other genera. The sheath around the spines nowhere adheres to the bodywall. The connecting septum is either very broad and short, so that sometimes it is more like an extensive fusion of bodywall and axis-epithelium, or thin. Near the top of the branches the axis has two lateral, very broad connecting septa (Pl. VI, fig. 1), which are very massive. Between them lies a part of the gastral cavity, opposite to which is found the thinner part of the bodywall-ectoderm with a groove in its mesogloea on the ectodermal side. In one place the bodywall is even ruptured, but probably this is an artificial opening. — Each time this double connection is substituted by a single median septum, but furtheron again a double septum may be found. It gives the impression as if the invagination-process of the axis does not proceed in a regular manner from the top towards the base of the colony; sometimes the invagination is very advanced (single connecting septum), at other places the invagination is shallower (a double septum), so that the layer in the cavity opposite the groove (Pl. VI, fig. 1) might be ectoderm and not entoderm, and this cavity might not be a part of the gastral cavity; this point is not to be decided by the anatomical structure. — In the area between two polyps an interzooidal septum is found with a free border; I can find no peristomal fold between the parts of a polyp. In one series of sections there is a constriction between the sagittal and lateral parts of the polyps but not between two polyps. In other series a constriction is nowhere to be found; the oral cone is visible (so the middle or sagittal part of the polyp), while the ova are also visible (so the lateral part of the polyp) in the same section.

Actinopharynx. The ectoderm, 28—40 μ thick, has a very great number of the large deeply staining glandcells, which are found in the entoderm of *Sibopathes gephura*. Between them and in the upper part of the epithelium the number of nuclei is very large. No musclefibres are visible while the pigment is entirely absent. The actinopharynx descends deeper on the side of the sagittal mesenteries than on the side of the transversal mesenteries. The mesogloea is extremely thin, usually even invisible since the preservation is rather bad. Everywhere the thickness is only a fraction of 1 μ. — The entoderm (26 μ) is the same as in tentacles, bodywall, etc. — It is to be remarked that the absence of the actinopharynx in *Sibopathes gephura* might be explained as a seeming absence through the very great thinness of the mesogloea. But *Sibopathes gephura* has in its entire entoderm of the body-cavity the same glandcells, which with *Schizopathes* are only present in the actinopharyngeal ectoderm. Besides there are other points, which are in favour of my opinion, viz. absence of mesenterial filaments, narrow mesenteries with a free border, a clearly visible limit between the entoderm of the gastral cavity and the ectoderm of the oral cone, etc.

Mesenteries. In the lateral third parts of the polyp only the transversal mesenteries are present. The sagittal mesenteries are only to be found in the middle third part of the polyp; they are inconspicuous. The secondary mesenteries are of even less importance; both pairs are only present in the oral cone and they do not descend any farther down than over two thirds of the depth of the oral cone. As far as can be made out these secondary mesenteries are not attached to the actinopharynx; their border is entirely free on this side. Perhaps this is only seeming through the thinness of the mesogloea but in any case the mesogloea of the secondary mesenteries is much broader on the side of the bodywall than on the side of the actinopharynx. They do not give the impression of mesenteries, which spring from the actinopharyngeal wall to be attached only in a secondary manner to the bodywall. On the contrary it is more probable that the secondary mesenteries have originated on the bodywall in this case. — The transversal primary mesenteries are also very thin, max. 10 μ near the bodywall, but this value diminishes into a fraction of 1 μ at the side of the actinopharynx. In the lateral third parts of the polyp they are somewhat better developed, but not much; here they are convoluted (Pl. VI, figs. 14 and 16). On none of the mesenteries musclefibres are to be found nor mesogloeal lamellae.

The mesenterial filaments have the same anatomical structure as the actinopharyngeal ectoderm. They are single-lobed, and only to be found along the transversal primary mesenteries. They are very convoluted; pigment is entirely absent.

Reproductive organs. Ova are only to be found in the transversal primary mesenteries; these mesenteries have a swollen part, close to the bodywall; the distal part of the mesentery is thin again. This swollen part is the zone, where the ova originate; sometimes this swollen part is for a certain distance loosened from the mesentery on the side of the bodywall. These ova are to be found in the lateral third parts of the polyps, but in the sections through the oral cone ova may also be found in the transversal mesenteries. The diameter of the ripe ovum is 400 μ; the gastral cavity is large enough to contain them but they may also be found in the tentacles, which are enormously swollen in such a case. Each

ovum is enveloped in a very thin membrane, visible in Pl. VI, fig. 14, to the left, near the opening of the invagination, separated from the proper mesogloea-capsule, which is less than 1 μ in thickness. This capsule is thinner in young ova, especially in that part, which is farthest from the invagination-opening (Pl. VI, fig. 16). The ova get their mesogloeal capsule by invagination; with the ripe ova there is no trace of this invagination to be seen but with young ova (Pl. VI, figs. 14 and 16) the opening of the capsule is clearly visible, which is shut in a later state.

There are no PARASITES to be seen. — On one place the bodywall is ruptured by a long narrow slit, parallel with the colony-axis, at a little distance beneath the base of the tentacles; the ectoderm of the bodywall is partly grown inwards, as is demonstrated by the colouring of the epithelium.

12. *Eubathypathes patula* (Br.) emend. [1]).

In all the series of sections the ectoderm of tentacles and bodywall has entirely disappeared. The entoderm is also very much damaged, to such a degree that only with a certain reserve data can be given of the internal structure of the polyps. To this should be added that the mesogloea is rather thin on many places, so that usually this indication of the situation of the parts of the polyps is not very clear. — Only the following data may be given:

TENTACLES. The mesogloea, 6 μ thick, diminishes to 3 μ at the top of the tentacles. This layer is homogeneous and there are no lamellae for musclefibres. The mesogloea is thinner than that of the bodywall! The entoderm is thick, so that there is no lumen in the tentacles, but it is possible that the maceration makes the entoderm looser and broader. There are no deeply staining glandcells, but very numerous large hyaline glandcells.

BODYWALL. The mesogloea is 10—23 μ thick; the thickest parts are found between the base of the tentacles and near the connecting septum of the axis. The thickness diminishes towards the oral cone. The entoderm is the same as in the tentacles. No interzooidal septum is to be found.

The ORAL CONE has a mesogloea of 4 μ and the same entoderm as in other cases.

The AXIS has a wall of 26 μ with a diameter of the lumen of 150 μ; near the top of the branch these dimensions are 7 μ and 250 μ. The spines (66 μ) have no basal lumen. There are no fusions to be seen between the layers round the spines and the bodywall. The axis-entoderm is 3 μ (12 μ near the base of the spines), the mesogloea 3 μ and the entoderm 9 μ. The connecting septum is short and broad or triangular with its top fixed to the bodywall. This septum lies asymmetrically, not precisely opposite the mouth. The mesogloea of the bodywall shows an indentation at the ectodermal side opposite the connecting septum.

The ACTINOPHARYNX is not clearly visible; probably it is broadened in the middle third part of the polyp. The mesogloea is very thin. Pigment is entirely absent.

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1) Specimen of station 88.

Mesenteries. The secondary mesenteries and the sagittal primary ones are only visible in the middle part of the polyp. None of the mesenteries show a trace of mesogloeal lamellae. The thickness of the mesogloea diminishes from 2 μ near the bodywall, to less than 1 μ at the actinopharyngeal side. The transversal primary mesenteries are 3 μ broad near the bodywall and also diminish in thickness towards the actinopharynx. They are very much convoluted and sinuous. In the lateral third parts of the polyps the free border of these mesenteries is swollen. This swelling is relatively inconspicuous in the fertile part of the mesentery but much more conspicuous in the part near the interzooidal area; furtheron the swelling diminishes together with the width of the mesentery. These mesenteries do not reach as far as the extreme limit of the polyp. — The transversal mesenteries can easily be followed in the intervening space between the middle and the lateral third parts of the polyps.

The mesenterial filaments are very uncertain; probably they are numerous and branched to a high degree.

Reproductive organs. There are only ova to be found, with a very thin mesogloeal capsule (2 μ thick) in the transversal primary mesenteries. The diameter of the ovum is 105 μ; the nucleus is large. Several ova are to be seen in one and the same section. The ova occur only in the lateral third parts of the polyps, but not in the middle third part. The gastral cavity is large enough to contain them, so that they do not enter the lumen of the tentacles. Their mode of origin, or a unilateral situation in the mesenteries, is not to be made out.

There are no parasites to be seen.

13. *Euantipathes dichotoma* (Pall.) emend.

I will describe the anatomy of a specimen from station 204 as a type and I let it follow by the divergations shown by specimens of other stations. I was able to make sections through the polyps from stations 64, 79[a], 164, 193, 204, 213, 250 (3 colonies), 257 and 313.

Tentacles. The ectoderm is composed of papillae, so that the greatest thickness is 35 μ, while it is only 10 μ between two papillae. On the top of the papillae there is a nematocyst-battery, surrounded by deeply staining glandcells. The papillae are constricted at their base. The nervous layer lies very near the mesogloea. There are no ectodermal musclefibres. — The mesogloea is a homogeneous layer, 15 μ thick at the base of the tentacles, 8 μ at their top. Cells are absent. — The entoderm, 20 μ thick, has only a very few deeply staining glandcells but a great number of hyaline ones. There are no musclefibres.

Bodywall. The ectoderm, 12 μ thick, has the same structure as the tentacular ectoderm minus the nematocyst-batteries. There are however a greater number of deeply staining glandcells, but only locally; i. a. the interzooidal area has locally so many glandcells as to form dark palissades. There are also parts of the ectoderm where there are none at all. The mesogloea (5 μ) and the entoderm (5 μ) are the same as in the tentacles. There is no interzooidal septum.

The layers of the oral cone are resp. 16 μ, 7 μ and 7 μ thick. The structure of the layers is the same as in the rest of the bodywall.

The AXIS has a cellular intima; the wall is 40 μ with a diameter of the lumen of 50 μ; nearer the top this values are resp. 7 μ and 33 μ. The spines are 20 μ long; they are hollow, often with a granular lumen. The axis-ectoderm is 2 μ thick, but 7 μ at the base of the spines. The mesogloea is less than 1 μ; the entoderm 4 μ. The connecting septum is short and narrow but in the interpolypar area this septum is more like a fusion of the bodywall and the axis-layers, over half of the circumference. — The sheath of layers around the spines may be fused with the bodywall; the spines project rather far into the polyps; in one case a testes-capsule is indented kidney-shaped by a spine.

ACTINOPHARYNX. As in every examined species, here also the actinopharynx descends deepest on the side of the primary sagittal mesenteries but it extends horizontally widest along the primary transversal mesenteries. The ectoderm, 33 μ thick in the higher part of the actinopharynx, diminishes to 25 μ in the lower part. Near the free lower border the ectoderm is folded deeply with mesogloeal lamellae as supports in the folds. These folds may be followed rather high in the actinopharynx. There is a great number of actinopharyngeal glandcells and also of hyaline ones. Pigment is entirely absent. The actinopharyngeal ectoderm is not continued as a lip out of the mouth. There are no musclefibres. In its lower part the actinopharynx touches for some distance at the axial sheath. — Mesogloea (3 μ) and entoderm (4 μ) are of the same structure as in the bodywall.

The MESENTERIES are normal in number and situation. Their mesogloea is 2 μ, their entoderm 3 μ thick; musclefibres are entirely absent, while there are neither mesogloeal lamellae. The secondary mesenteries descend deeper, partly on the side of the bodywall, partly on the side of the actinopharynx.

The MESENTERIAL FILAMENTS are of actinopharyngeal ectodermal structure; they are single-lobed, broader than the mesentery. Pigment is entirely absent. Along the transversal primary mesenteries they are branched as in Pl. V, fig. 2.

REPRODUCTIVE ORGANS. There are only testes to be found. The greatest diameter of the oval capsules is 100 μ; they are so large that only 4 or 5 of them are visible in one and the same section, filling the available space, while only some of them are fully developed. Many of them, but not all, are ripe. In this case the bundle of tails is cylindrical or fan-shaped. Sometimes the bundle is composed of secondary ones, as is apparent from the groups of heads. Each testis is separately inclosed in a very thin mesogloeal capsule, which is thicker with the unripe testes. On several places it can be clearly made out that the testes-capsules are formed by invagination of the mesogloea of the mesenteries, so that apparently the testes lie at the other side of the mesenteries than where they came from. They are found only unilaterally in the transversal primary mesenteries, but not at all in the other mesenteries. — As a divergation of the normal condition, testes may be found in the entoderm of the ultimate part of the actinopharyngeal border, in the neighbourhood of the transversal mesenteries. This is not so very strange, since this part of the entoderm immediately adjoins the mesenterial entoderm, which also contains many testes. — In one case I see the top of the bundle of spermatozoa emerge from the mesogloeal capsule; probably the spermatozoa are liberated in this manner, through the original opening of the invagination, perhaps secondarily opened.

There are no PARASITES to be seen.

As to the GROWTH OF THE COLONY, I found a young polyp between two adult ones; only the sagittal tentacles were present, but the lateral ones were absent. The oral cone was well developed and the mouth was formed. The actinopharynx was also normally developed, as well as the primary mesenteries and the mesenterial filaments. It could not be decided with certainty, whether the secondary mesenteries were absent, but it seemed to me that this was the case. — There were no testes in the transversal mesenteries.

Specimens of the other stations showed the following divergations. The specimen of station 164 has in its ectoderm (which is not very well preserved) of bodywall and tentacles no nematocyst-batteries apparently, while there are narrow, homogeneous, deeply staining gland-cells to a small number; large parts of the ectoderm are entirely destitute of them. The mesogloea is very thick, max. 60 μ (!) with some rare cells, but without fibres; in the body-wall the mesogloea is 30 μ thick and 33 μ in the oral cone. The actinopharyngeal ectoderm is 70 μ thick and its mesogloea 5 μ, which is a great deal for an actinopharynx. The mesenterial filaments are straight and not branched.

One of the five specimens of station Kur, described on p. 60 after the type-specimens, has got its nervous layer not so deep in the ectoderm; there may be a very slightly developed layer of musclefibres in the tentacular ectoderm. Their mesogloea is thinner: 3 μ in the tentacles and bodywall, 6 μ in the oral cone. The entoderm of the tentacles has also a few slight musclefibres. The ectoderm of the oral cone has nematocyst-batteries and a greater number of glandcells than the bodywall. The axis-wall is 16 μ, while the lumen-diameter is also 16 μ or slightly more (the sections are made through a top-part of both colonies); the epithelial layers are resp. 10,1 and 10 μ thick. — There are slightly developed longitudinal musclefibres in the actinopharyngeal ectoderm. The secondary mesenteries are inserted on a somewhat lower level on the actinopharyngeal side than on the side of the bodywall. The mesenterial filaments are short and straight along the sagittal mesenteries and unbranched, but convoluted, along the transversal mesenteries. The thickness of the mesenteries (7 μ) increases to 33 μ near the filaments, diminishes suddenly into a short, narrow stalk, inserted in the concave side of the kidney-shaped filament, the greatest breadth of which is 60 μ (cf. Pl. IV, fig. 1). Near the polypar limits the transversal mesenteries are without filaments, but the free border is broadened with a swollen mesogloea as in Pl. I, fig. 10. — The specimen of station 79^a has the same anatomical structure as the here-described polyps, but they are not so very well preserved.

Of the other specimens of station 250 (Kur) one [1]) has only a very small number of deeply staining glandcells in the tentacular ectoderm so that the nematocyst-batteries for the greater part have no envelope of glandcells, while the other specimen out of the same bottle has often locally a great number of these glandcells. The nervous layer is well separated from the mesogloea. There are no longitudinal musclefibres in the tentacular ectoderm, or only very slightly developed ones. There is an interzooidal septum to be found. The spines are club-shaped with an extension of the axial lumen in their base so that it is obvious that they have originated

1) One of both colonies, which precede in the systematic description the other 5 colonies, on p. 59.

by a folding of the axis-wall. Near the top of the colonies the axial layers are for the greater part fused with the bodywall so that the gastral cavity is nearly absent. — The oral cone is a double funnel with a very wide mouth and a distinct lip in one of the colonies, but in the other one it is dome-shaped with a small mouth, as in the normal type. In one colony there is a brownish green pigment in the actinopharyngeal ectoderm but only in the lowest part. The mesenterial filaments, very slightly developed along the sagittal mesenteries, are branched and convoluted (as to fill the greater part of the gastral cavity and the basal half of the tentacular lumen) along the transversal ones in one colony, but very slightly developed in the other colony. They are kidney-shaped in section, with a very abundant pigmentation. This pigment is not quite the same as in other species; it gives the impression of being of nutrimental origin since the same material is found as an amorphous mass in the gastral cavity, the actinopharynx and even in the mouth; for sure it is worthy of note that it is entirely absent in the other colony. — Along the primary transversal mesenteries, but not along the other ones, there are muscular fibres to be found with small mesogloeal lamellae, but only in a very undeveloped condition.

The specimen of station 64 has a tentacular ectoderm, which is very rich in deeply staining, homogeneous glandcells, while they are entirely absent in the ectoderm of the tentacles; the same holds good for the bodywall and the oral cone. The spines are club-shaped with a thin stem. The mesenterial filaments are found only along the primary transversal mesenteries.

The specimens of stations 193, 213 and 313 have some longitudinal musclefibres in the tentacular ectoderm, while the nervous layer is separated by an interval from the mesogloea. The ectodermal origin of the axis can be examined in the cross-sections through the apex of this colony. At the top itself there is only a cylinder to be seen of ectoderm, mesogloea and entoderm; the ectoderm has many glandcells. But at a distance of 9 μ from the top there is a small ectodermal massive invagination in the mesogloea; in the following sections this invagination contains the axis as an intricate mass of epithelial cells and horny matter. In other sections, still further from the top, these cells arrange themselves into a high cylindrical epithelium, at first irregular in thickness, with an irregular axis, but furtheron with a uniform thickness and a round axis, which by now is yellow, while at first it was colourless. The ectoderm is 33 μ, the mesogloea less than 1 μ, the entoderm 7—14 μ (normally: resp. 5—8, less than 1, and 5 μ). At first the connecting septum is a very broad fusion between the bodywall and the axial sheath, but soon the septum diminishes to a very short and narrow strip. — The actinopharynx broadens as in the general type, but it is constricted at a certain depth before it broadens again to a still greater extent. The mesenterial filaments are only to be found along the transversal mesenteries and they are unbranched and only slightly convoluted.

The specimen of station 257 has some nematocyst-batteries in the ectoderm of its bodywall. The existence of an interzooidal septum is dubious. While the ectoderm of the oral cone is rather sparingly provided with deeply staining glandcells, these cells (not of the actinopharyngeal type) are very profuse in the interior of the mouth and the neighbourhood of the mouth. There are no musclefibres in the mesenteries but in the primary transversal mesenteries one side of the mesogloea is somewhat swollen. The mesenterial filaments along these mesenteries are branched. In the mesenterial filaments, which are circular in section, the mesogloea of the

mesenteries is forked as in other species, but the angle between the fork is acute, while this mesogloea is not the limit between the entodermal and the ectodermal part (as is usually the case) but the actinopharyngeal glandcells are found in a large number on the mesenterial side of the fork, while they are less in number between the fork. — The testes are unripe, with a central area, lacking nuclei; they are surrounded by a very thin mesogloeal capsule. In all other respects the colonies, which I examined, are quite the same as the type of station 204.

The following table gives the respective numerical data (in μ) for the thickness of the layers in the examined colonies.

Station	Tentacles			Bodywall			Oral cone			Actinopharynx			Mesent.		Axial layers			Axis	
	ec	*me*	*en*	*ec*	*me*	*en*	*ec*	*me*	*en*	*ec*	*me*	*en*	*en*	*me*	*ec*	*me*	*en*	*wall*	*lumen*
64	16	10	16	12	7	12	16	10	16	50	2	10	10	1–3	(7–)16	1	4	4	56
79a 1)	10	3	10	10	3	7	13	6	7	30	1	7	3	1	10	1	10	16	16
164	35	60	?	14?	30	?	15	33	13?	70	5	5	?	7					
193	24	4	16	7	3–4	7	7	3	7	30	1	5	5	1	(5–)8	1	5	3–5	50
204	35	8–15	20	12	5	5	16	7	7	33	3	4	3	2	(2–)9	1	4	7–40	33–50
213	24	4	16	7	3–4	7	7	3	7	30	1	5	5	1	(5–)8	1	5	3–5	50
250 2)	40	10	30	20	4	10	20	3	7	33	1	6	4	2	4	1	4	33	90
257	27	3	16	7–20	4–7	7–10	23	8	7	27	1	7	5	2	(3–)10	1	3–5	23	43
313	24	4	16	7	3–4	7	7	3	7	30	1	5	5	1	(5–)8	1	5	3–5	50

It is evident from this tabel that these data are extremely variable.

14. *Euantipathes plana* (F. Cooper).

The state of preservation, especially of the ectoderm, is rather bad; the axis having been broken off in the sections, almost all the sections are disruptured and incomplete. Generally the mesogloea is very large. We can state the following data only:

Tentacles. The ectoderm contains nematocyst-batteries, surrounded by deeply staining glandcells. The mesogloea (20 μ) is a homogeneous layer with circular ridges at the entodermal side. Now and again there are very dense fibrillar bundles. — The entoderm (12 μ) has no deeply staining glandcells.

Bodywall. The dimensions are uncertain; the mesogloea is very thick; deeply staining glandcells are visible here and there.

The oral cone has a mesogloea of 10 μ or irregular in thickness, and an entoderm of 6 μ.

The axis has a wall of 80 μ with a lumen-diameter of only 20 μ! The spines are 75 μ; they lift the bodywall and they project very far into the polyps, i. a. almost reaching the top of the tentacular lumen.

Actinopharynx. The ectoderm (20 μ) has a great number of actinopharyngeal gland-

1) And 5 spec. from Kur (p. 60).

2) Both type-specimens of p. 59.

cells, also hyaline ones, and a few deeply staining ones. There are very slightly developed circular musclefibres. In the mouth itself there is an accumulation of deeply staining glandcells (the type of the nematocyst-batteries), but no lip is formed. In the lower part of the actinopharynx the ectoderm is very much folded. The mesogloea, 2 μ thick, suddenly increases to 5 μ at the free border of the actinopharynx. The entoderm (6 μ) is destitute of deeply staining glandcells.

The MESENTERIES are normal, as far as they can be followed. There are no mesogloeal lamellae or musclefibres. The entoderm is 4 μ, the mesogloea 1 μ.

The MESENTERIAL FILAMENTS are not visible.

REPRODUCTIVE ORGANS. There are some testes, with a very thin mesogloeal capsule, oval in shape. The greatest diameter is 60 μ, the smallest 40 μ. — They are not ripe. — We cannot make out their manner of origin.

15. *Euantipathes ericoides* (M. Edw.).

TENTACLES. The ectoderm (33 μ) is papillose. On each papilla there is a large nematocyst-battery, surrounded by rather numerous, deeply staining glandcells, which are not to be found in other places of the ectoderm. The nervous layer is very near the mesogloea. There are no musclefibres. The mesogloea, varying from 3—17 μ from the top to the base of the tentacles, is homogeneous, except for very rare oval cells in some parts, while fibres, right across the mesogloea, we also very rarely meet with. — The mesogloea shows circular ridges on the entodermal side. The entoderm is almost entirely destitute of deeply staining glandcells. There are no musclefibres; its thickness (33 μ) is so great as to obliterate nearly the entire tentacular lumen.

BODYWALL. The entoderm is in its thinnest parts 6 μ, but the numerous nematocyst-batteries, with their surrounding of glandcells, give it a thickness of 23 μ. The entire structure is like that of the tentacular ectoderm. The mesogloea (5 μ) has oval cells sparingly distributed in its thicker parts, especially where the primary sagittal mesenteries are connected with the bodywall. Fibres across the mesogloea may sometimes be observed. The entoderm (8 μ) is the same as in the tentacles. — There is no interzooidal septum.

The ORAL CONE, which is almost vertical, has a somewhat thicker ectoderm, especially near the mouth (15 μ).

The AXIS has a wall of 40 μ with a lumen-diameter of 40 μ. The spines are 70 μ long, so that repeatedly a fusion occurs between the axial sheath and the bodywall, but also with other parts i. a. with the primary transversal mesenteries, halfway between the bodywall and the free border, which bears the mesenterial filaments. The axis-ectoderm, with entodermal structure, is 3 μ, which increases to 7 μ at the base of the spines; the mesogloea is 1 μ, the ectoderm 3 μ. The connecting septum is double-funnelshaped in section or triangular with its broad side towards the axis. —

In its ectoderm (27 μ) the ACTINOPHARYNX has only actinopharyngeal glandcells. At the mouth the actinopharyngeal ectoderm extends outwards as a lip. Here and also in the

lower part of the actinopharynx the ectoderm is thinner. Pigmentation is entirely absent. — The mesogloea is less than 1 μ; the entoderm (4 μ) is the same as in the other parts. The actinopharynx, the wall of which is very much folded, descends to the axis, curves outwards and follows the axial sheath for a great distance so that hardly any gastral cavity remains. The wall is elevated by eventual spines.

The MESENTERIES are normal in course and number. Their mesogloea is 2 μ, their entoderm 6 μ. There are no musclefibres but on the primary transversal mesenteries and on one of the pairs of secondary ones mesogloeal lamellae are found, on the averted sides of these mesenteries. These lamellae are not found on the other mesenteries. The secondary mesenteries descend to a lower level on the side of the bodywall than on the actinopharyngeal side.

The MESENTERIAL FILAMENTS along the primary transversal mesenteries are convoluted and somewhat branched. They are straight along one of the pairs of primary sagittal mesenteries, and here they entirely descend along the free border, but the other pair of sagittal mesenteries has no filaments. Since there is a greater distance between the transversal mesenteries and the filament-bearing sagittal ones than between the transversal ones and the other pair, and since in the greater intermesenterial area the secondary mesenteries are better developed than in the smaller area, the polyp-section is not bilaterally symmetrical in regard to the sagittal axis. — The mesenterial filaments are single-lobed and although they are broader than the mesentery, the mesenterial entoderm broadens gradually into the breadth of the ectodermal cap. They have the structure of the actinopharyngeal ectoderm, but there is some brown pigment on the limit of ectoderm and entoderm, and sometimes also in the rest of ectodermal part.

REPRODUCTIVE ORGANS. There are only ova to be found in the primary transversal mesenteries. These ova are large with a diameter of 65 μ (nucleus: 26 μ) so that there are only a few ova to be seen in one section. There is no mesogloeal capsule for the whole ovarium but there is a very thin sheath around each ovum. The mode of origin is not to be made out.

PARASITES are not found.

16. *Euantipathes ulex* (E. and S.).

The preservation is so very bad as to make the ectoderm and the entoderm practically invisible. Only the mesogloea can be examined. This mesogloea is a homogeneous layer, max. 6 μ in the tentacles and in the bodywall, 1 μ in the axial sheath. The rest is not very well to be distinguished; the mesenteries are narrow. The oral cone is very low (16 μ) and so the actinopharynx is also short (50 μ). The mouth is wide, since the cone is constricted at its base, but widens so much that its wall is almost in contact with the bodywall.

REPRODUCTIVE ORGANS. There are oval testes, with a long axis of 120 μ and a short axis of 80 μ. Each one is surrounded by a thin mesogloeal capsule, less than 1 μ thick. They are not all of them ripe; when this is the case, they contain a fan-shaped bundle of spermatozoa. The testes are found in the tentacular lumen also; they are large in proportion to the polyp

so that no more than 2 or 3 are usually found in one section; sometimes there is only room for a single one. Usually there is one to the right of the axis, and one to the left, in the gastral cavity. — Probably they are found only in the primary transversal mesenteries; their manner of origin cannot be made out.

The AXIS has a wall of 27 μ with a lumen-diameter of 35 μ. The spines are 75 μ, so that fusions occur between bodywall and axial sheath. The connecting septum is narrow and 16 μ long.

17. *Euantipathes myriophylla* (Pall.).

TENTACLES. The ectoderm (45 μ) has rather numerous nematocyst-batteries, surrounded by a few deeply staining glandcells, which may be entirely absent here and there. There are always hyaline glandcells. There is a brown pigment everywhere in the ectoderm, principally in the lower half, but also over the entire depth of the ectodermal layer. This pigment is not found in the nematocyst-batteries, which are encased in a cup of pigmentation. The pigment is very fine, never making the ectodermal structure indistinct, but rather emphasizing it. The nervous layer is lying close to the mesogloea. There are no musclefibres or only very slightly developed ones with small mesogloeal lamellae. The mesogloea (3 μ) is homogeneous. The entoderm (16 μ) has a few small, deeply staining glandcells, but a great number of hyaline ones. There are no musclefibres.

BODYWALL. The layers, 33, 2 and 7 μ thick, have the same structure as in the tentacles, minus the nematocysts. The pigment is also present. The same holds good for the ORAL CONE, the ectoderm of which is somewhat thicker at the top. There is no interzooidal septum.

AXIS. The wall is 26 μ with a lumen-diameter of 26 μ. The spines are 130 μ and they lift the bodywall very high so that a section of the bodywall is not a circle but an irregular polygon. There are frequent fusions between the axial sheath and the bodywall. — The spines are club-shaped without a basal lumen. — The axis-ectoderm is max. 10 μ, the mesogloea 1—5 μ. The entoderm is very thick (23 μ!) and contains a great number of hyaline glandcells. The connecting septum is triangular with its top towards the bodywall, or everywhere of equal breadth.

ACTINOPHARYNX. The ectoderm has only a great number of actinopharyngeal glandcells. The pigment, which is found in the tentacles and in the bodywall is entirely absent here. The mesogloea is less than 1 μ thick; the entoderm (10 μ) is the same as in other parts. — In some polyps there is a distinct lip, especially on the distal side of the oral cone, since it is curved distally.

The MESENTERIES are normal in number and course; there are no musclefibres or mesogloeal lamellae.

The MESENTERIAL FILAMENTS are convoluted, but not to a very extensive degree, along the transversal mesenteries, and short and straight along the sagittal ones. In section they are kidney-shaped, much broader than the mesentery. Pigmentation is entirely absent. — The filaments project far into the tentacular lumen, perhaps while the gastral cavity is occupied by parasites. There are no ova or testes.

PARASITES. In one of the series of sections there are numerous unicellular parasites (?). At first they give the impression of being ova, but the small nucleus, the large vacuole, their independence from the entoderm prevent this opinion. Their plasma is granulated; the globular nucleus has a diameter of 12 μ in a cell, the dimensions of which are $50 \times 80 \times 110\ \mu$. — Often there is a large vacuole in the cell; the vacuole-diameter is 40 μ with cells of resp. $60 \times 70 \times 40\ \mu$ and $70 \times 130 \times 80\ \mu$. The cell is surrounded by a very thin membrane. They are never found in the entoderm, but always loose in the gastral cavity, and especially in the lumen of the tentacles. These parts of the polyps are not swollen, but the adjoining entoderm is reduced to a thinner layer, but not always. There are no further changes. Sometimes there are several parasites in the same tentacle and there are always a great many in the same polyp.

18. *Euantipathes abies* (Gray).

TENTACLES. The ectoderm (33 μ) has nematocyst-batteries on the top of the papillae, with a surrounding of not very numerous, small, deeply staining glandcells. The hyaline glandcells are much more numerous. — The nervous layer is very deeply seated, so that there is no sharp limit between it and the mesogloea. There are no musclefibres. The mesogloea (3 μ) is homogeneous, and only slightly fibrillar at the base of ectoderm or entoderm. The entoderm (10 μ) has a few deeply staining glandcells and many hyaline ones. There are very slight circular musclefibres.

BODYWALL. The ectoderm (16 μ) has the same structure as in the tentacles, except for the batteries. There are no musclefibres. The mesogloea (2 μ) and the entoderm (8 μ) are the same as in the tentacles. An interzooidal septum is not to be made out with certainty.

AXIS. The ectoderm (4 μ) has some deeply staining elements; the mesogloea is less than 1 μ; the entoderm is very thick for an axis-entoderm, viz. 20 μ and even more at the base of the spines; at the top of the spines this layer is still 10 μ. The connecting septum is short and very broad.

ACTINOPHARYNX. For the greater part this is a straight tube, slightly distally inclined. The ectoderm (20 μ) has many actinopharyngeal glandcells, but no pigment. The other layers are resp. 1 and 6 μ. — There is no lip; the ectoderm of the oral cone is somewhat thicker than in the rest of the bodywall.

The MESENTERIES are normal in course and number; they have no musclefibres; the layers are 10 μ (entoderm) and 2 μ (mesogloea).

MESENTERIAL FILAMENTS occur along the primary transversal mesenteries; they are convoluted but unbranched (?). They are single-lobed, while the mesenterial entoderm broadens gradually towards the filaments. In the basal part of the filaments the same cells occur as in the same place in Pl. IV, fig. 1. There are no ova or testes.

19. *Euantipathes japonica* (Brook) emend.

TENTACLES. The ectoderm (33 μ) is a little like the ectoderm of *Eucirripathes Rumphii*. There is a great number of nematocyst-batteries (but only with one type of nematocysts) situated

on the top of the papillae and surrounded by deeply staining, homogeneous glandcells. The batteries are so crowded as to give not much room for the intervening supporting cells, which are not numerous. The nervous layer is in contact with the mesogloea. There are no muscle-fibres or only very slight longitudinal ones.

The mesogloea (4—5 μ) is rather variable in thickness. It is a homogeneous layer, and only in the thinner parts it is fibrillar through the base of ectoderm and entoderm. The mesogloea shows circular ridges on the entodermal side. The entoderm (15 μ) is badly preserved; there are slight circular musclefibres.

Bodywall. The layers, resp. 5, 1 and 13 μ thick, have the same structure as in the tentacles, except that the musclefibres and the batteries are absent.

The oral cone keeps in thickness the middle between the bodywall and the tentacles. It is constricted at its base and at the mouth. The actinopharyngeal ectoderm is continued as a lip outside the mouth. — An interzooidal septum is not to be seen.

Axis. The ectoderm is 6 μ, the mesogloea less than 1 μ, the entoderm 10 μ. The spines lift the bodywall very high, while there are frequent fusions between the axial sheath and the bodywall. The spines project far into the gastral cavity between the mesenterial filaments. The axis has a wall of 24 μ with a lumen-diameter of 50 μ. The connecting septum is short and not very well to be distinguished from the fusions at the top of the spines.

Actinopharynx. The ectoderm (16 μ) has many actinopharyngeal glandcells but no pigmentation. The mesogloea (2—3 μ) is fibrillar; the entoderm (13 μ) is the same as in the other parts.

Mesenteries. They are difficult to trace, but they show no divergation in number or course. They are short. Musclefibres or mesogloeal lamellae are not to be seen. The mesenterial filaments only occur along the primary transversal mesenteries. They are convoluted and fill the entire gastral cavity. The ectodermal part is separated from the mesentery by a constriction of the entoderm. — There are no ova or testes.

20. *Euantipathes longibrachiata* n. n.

The polyps are taken from the higher part of the colony.

Tentacles. On the top of its papillae the ectoderm (50 μ) has nematocyst-batteries with surrounding glandcells. The nervous layer is clearly separated from the mesogloea. There are very slightly developed longitudinal musclefibres. The mesogloea (25 μ) is a homogeneous layer. Locally bundles of transversal fibrillae occur, especially at the base of the tentacles. There are circular ridges on the entodermal side (as in Pl. II, fig. 3). The entoderm (40 μ) contains only a few deeply staining glandcells, but many hyaline ones. There is no nervous layer and only very slight circular musclefibres.

Bodywall. The layers, resp. 14, 7 and 14 μ thick, have the same structure as in the tentacles, minus the batteries and the musclefibres. There is an interzooidal septum but no secondary ones, even no mesogloeal ones.

The oral cone, with layers of 65, 20 and 26 μ, has the same structure as the tentacles.

There are slight circular musclefibres in the entoderm. The oral cone is not constricted at its base. In its mesogloea there are local crowdings of transversal fibres.

The AXIS-layers are lost for the greater part; as far as it can be made out, the layers were extremely thin. There are very frequent fusions between the bodywall and the sheath of the spines, which project also far into the gastral cavity.

ACTINOPHARYNX. The lumen is slit-like in its upper part, with almost touching entoderm; in its lower part the lumen is a wide oval, almost a circle. The free actinopharyngeal border is curved upwards towards the bodywall. The ectoderm ($55\ \mu$) is very much folded; there are many actinopharyngeal glandcells but no pigment. Longitudinal musclefibres are clearly visible. The homogeneous mesogloea is $1-4\ \mu$. The entoderm ($20\ \mu$) has no musclefibres, and is of the same structure as in the bodywall.

The MESENTERIES are normal in number. The entoderm is $15\ \mu$, the mesogloea $1-10\ \mu$. The secondary mesenteries leave the bodywall at a higher level than on the actinopharyngeal side. Afterwards they are extended between the actinopharynx and its curved free border, and still lower down they are fused with the primary transversal mesenteries. — These secondary mesenteries are thicker on the actinopharyngeal side than on the side of the bodywall, and the same holds good for the primary mesenteries. The musclefibres are very distinct. They are rather slight on one of the pairs of primary sagittal mesenteries, somewhat better developed on the other sagittal pair, and very strong on the transversal mesenteries. The musclefibres as well as the mesogloeal lamellae have the same aspect as in Pl. III, fig. 7. In all the polyps ($\pm$ 10) the following system is found. On the sagittal mesenteries the longitudinal musclefibres are situated on the averted sides of the mesenteries; on the secondary mesenteries they are all of them turned towards the primary transversal mesenteries, and on these they are found on the same, posterior, side. — This is the same system as in fig. 260.

In the lower part of the mesenteries, where the bodywall and the actinopharynx are farther apart, the large mesogloeal lamellae of the primary transversal mesenteries are found on one tenth only of the entire breadth of the mesentery, on the actinopharyngeal side. In tangential sections of the oral cone the transversal musclefibres can be made out very distinctly. Their mesogloeal lamellae are almost as well developed as those of the longitudinal fibres. — They are not found on the primary sagittal mesenteries, but on the transversal and the secondary ones they are situated at the opposite side of the longitudinal system. On that part of the mesenteries, which bears the mesenterial filaments the musclefibres on both sides of the mesentery are parallel with one another and with the free border of the mesentery. Both systems are so clearly visible that there can be no doubt about the exact mode of distribution of the musclefibres.

The MESENTERIAL FILAMENTS are single-lobed, of actinopharyngeal ectodermal structure, without pigment. They are round in section, as in Pl. I, fig. 18. They are straight and unbranched along the sagittal mesenteries, but convoluted and highly branched along the transversal primary mesenteries. They project even into the base of the lateral tentacles.

REPRODUCTIVE ORGANS are absent but still the gastral cavity is rather large, so that evidently the dimensions of the polyps are not entirely dependent upon the occurrence of ovaria or testes. —

There are unicellular PARASITES in the entoderm of the base of the tentacles, near the surface of this layer, but there are no symbiotic Algae.

21. *Aphanipathes Sibogae* sp. n.

The numerical date are deduced from a series of sections through a polyp, which was loosened from the axis, so an adult polyp; the description partly refers to younger polyps from the top of the colony, the axis of which was intact in an other series.

TENTACLES. The ectoderm (50 μ) has nematocyst-batteries, surrounded by deeply staining glandcells, on the top of the papillae. Sometimes the nervous layer is on a high level with and distinctly separated from the mesogloea, but at other places this layer almost touches the mesogloea. There is a layer of longitudinal musclefibres.

The mesogloea is 5 μ at the top of the tentacle and 30 μ at its base. It is a homogeneous layer without cells or fibres. The entodermal side has circular ridges with small secondary lamellae. The entoderm (35 μ) has hyaline glandcells only, but hardly any deeply staining ones or none at all. There is a layer of slightly developed circular musclefibres.

BODYWALL. The ectoderm varies from 10—16 μ in thickness. Its structure is like the tentacular ectoderm, but the nuclei are less in number and they are lying at a lower level. There are also nematocyst-batteries, but they are not so numerous as in the tentacles. There are no musclefibres. The mouth is situated at the same level as the rest of the bodywall so that the ORAL CONE is absent. Around the small rounded mouth the nematocyst-batteries are more crowded than elsewhere, still not so much as in the tentacles. The polyps are separated by an interzooidal septum, the lower border of which is fused with the axial sheath, so that the polyps are absolutely separated one from the other. Usually this septum has a free lower border in other species.

The AXIS has a wall of 33 μ with a lumen-diameter of 50 μ. The spines are 130 μ long, which is rather much, since the diameter of the entire colony-top is only 175 μ, a large part of which is occupied by the axis. They lift the bodywall very high and they project far through the various parts of the polyps. The sheath of the spines is fused with the bodywall, the three layers of which become very thin in these places. On the older parts of the colony the bodywall is not so highly elevated by the spines, by all means not exceedingly so when compared with other genera. — The ectoderm and entoderm are less than 3 μ, the mesogloea less than 1 μ. The connecting septum is short.

The ACTINOPHARYNX curves immediately towards the bodywall-entoderm and lies parallel with the bodywall, almost touching it, as to obliterate almost the entire lumen between both entodermal layers. In the toppart of the colony the actinopharyngeal ectoderm is very much folded, but in the older parts of the colony these folds are absent and the ectoderm is straight. The thickness is 50 μ; together with the actinopharyngeal glandcells some small, deeply staining glandcells of an other type also occur. Pigmentation is entirely absent. Near the mouth, in the mouth itself and in its immediate vicinity there is a very dense crowding of the type of glandcells, which usually surrounds the nematocyst-batteries. — The entire actinopharynx is almost in

contact with the axial entoderm, so that the gastral cavity is very much narrowed, except next to the free border of the actinopharynx, where the mesenterial filaments are found.

The MESENTERIES are normal in number and course They are all of them very narrow, even the primary transversal mesenteries, since the actinopharynx is at so short a distance from the bodywall. The entoderm is 6 μ thick, the mesogloea 1 μ; the mesogloea broadens, where the primary transversal mesenteries are fixed to the actinopharynx. Sporadical oval cells may be found in this broader part. At their extremities the primary transversal mesenteries are free from mesenterial filaments, but the mesogloea is broadened at the free border, club-shaped in section, but without the oval cells, which are abundant in these broadened borders in some *Eucirripathes*-species (cf. Pl. I, fig. 10). — There is no mesenterial musclesystem, but the primary transversal mesenteries have some unilateral mesogloeal lamellae without musclefibres; there is not much room on the narrow mesenteries for these lamellae.

The MESENTERIAL FILAMENTS are kidney-shaped with a breadth of 60 μ. The mesentery broadens perceptibly, but the ectodermal lobe is much broader. The ectoderm has the structure of the actinopharyngeal ectoderm, but there are also many hyaline glandcells. — There are also nematocysts in these filaments, but not together in batteries. — The filaments are branched and they are principally lying in the gastral cavity and in the base of the tentacles on one side of the actinopharynx.

REPRODUCTIVE ORGANS are absent.

22. *Aphanipathes indistincta* sp. n.

TENTACLES. The ectoderm (33 μ) has nematocyst-batteries, with surrounding deeply staining glandcells, on the top of the papillae, which are constricted at their base. The nervous layer is not very strongly developed and is found near the mesogloea. There are no musclefibres. The mesogloea (2—4 μ) is a homogeneous layer. The entoderm (15 μ) has no deeply staining glandcells and no musclefibres.

BODYWALL. The ectoderm, varying from 7—15 μ in thickness, is thickest in those places, where the deeply staining glandcells are very much crowded locally. In other parts these cells are entirely absent. There are also some nematocyst-batteries, but not many. The mesogloea (6 μ) is usually a homogeneous layer, but some oval cells may be found very rarely in the thicker parts. The entoderm (5 μ) is the same as in the tentacles.

The ORAL CONE is high, broad and cylindrical with a conical apex. The ectoderm is 12 μ in the vicinity of the mouth, but elsewhere it is thinner. There is no interzooidal septum.

The AXIS has a wall of 7 μ with a lumen-diameter of 45 μ. The spines are 40 μ; they lift the bodywall, but not to a high degree; they do not project very far into the polyps. The sheath of the spines may be fused with the bodywall. The spines are club-shaped with a basal constriction. The axis-ectoderm is 5—7 μ, the mesogloea less than 1 μ, the entoderm 5 μ. The intima of the axis has a cellular structure. The connecting septum is short and broad; sometimes it is more like a very extensive fusion of the bodywall and the axial layers. —

Towards the top of the colony the axis-ectoderm increases in thickness and becomes a cylindrical epithelium. The axis itself is not round in section but irregularly starshaped through the originating young spines, in which the axial lumen is continued as a narrow slit. Here the axis is very much like the top of the axis of *Dendrobrachia fallax* Brook. Still further towards the colony-top the entire axial entoderm is in contact with the entoderm of the bodywall and furtheron both entodermal layers are fused together for the greater part of its circumference. Even the last section through the top contains horny parts in the middle of the section. So the ectodermal invagination, in which the axis originates, takes place exactly at the extreme point of the colony, and not at a little distance from the top as is observed in other cases. — There is no single cylinder of ectoderm, mesogloea and entoderm to be found, in which the axis has not yet appeared.

Actinopharynx. The actinopharyngeal wall itself is very deeply folded, especially in those parts of the free border, which are attached to the primary transversal mesenteries. These parts are curved either dorsally or ventrally, so that those parts of the free border are almost in contact in the median plane. In the distal half of the polyp these curved parts of the actinopharynx even give origin to an entirely closed canal, a sort of glyphe but without a specific anatomical-histological differentiation. The ectoderm (22 μ) has a great number of actinopharyngeal glandcells, but no other deeply staining ones. There is no pigmentation. In the mouth the actinopharyngeal glandcells are very much crowded and also in its immediate vicinity, at the exterior. In one specimen there are also glandcells of the nematocyst-battery-type in the last named locality. — The entire ectoderm is very much folded longitudinally, also in the "glyphe"; these folds are secondary ones of the folds described with the entire actinopharyngeal wall. The mesogloea is less than 1 μ; the entoderm (5 μ) has the same structure as elsewhere.

Mesenteries. They are normal in number and course. The entoderm is 6 μ, the mesogloea 1 μ. There are no musclefibres, but the primary transversal mesenteries have very slightly developed longitudinal mesogloeal lamellae on one side of the mesentery.

The mesenterial filaments are found along the primary transversal mesenteries only. They are not in continuity with the actinopharynx for the latter part of the polyp has entirely disappeared in the series of sections for a distance of some 10 μ, before the filaments appear. They are convoluted and branched. They project far into the tentacular lumen. There is no pigmentation. They are single-lobed and kidney-shaped; the mesentery broadens gradually into the breadth of the filaments. The mesogloeal fork-ends are at right angles with the mesenterial mesogloea. There is also ectoderm to be found at the mesenterial side of the fork.

There are no reproductive organs.

23. *Parantipathes columnaris* (Duch.) Br.

Tentacles. The ectoderm (18 μ, but somewhat less at the base of the tentacles) contains large, deep nematocyst-batteries, which may project as a dome from the surrounding epithelium so that papillae are formed of a battery and nothing more. — They are surrounded

by deeply staining, granular glandcells. There are also larger glandcells with an alveolar structure. This latter type is closely crowded in very large parts of the ectoderm. There are no musclefibres while a nervous layer is absent. The mesogloea, less than 2 μ thick, is a homogeneous layer. The entoderm (7—12 μ) contains a great number of large, deeply staining glandcells with big, transparent vacuoles. They are lying at a very low level in the entoderm, but they are so large as to take up the entire depth of the entoderm.

Bodywall. The ectoderm (7 μ) has the same structure as in the tentacles but the nematocyst-batteries are very rare or entirely absent. The alveolar glandcells are very numerous. The mesogloea (1 μ) is sinuous. The entoderm (7 μ) is the same as in the tentacles.

The oral cone has the same structure as the bodywall but the ectoderm is somewhat less in thickness (max. 10 μ). There is no interzooidal septum to be found.

The axis is solid! There is no axial lumen. In some places it is entirely concentrically stratified, but in other places this stratification is invisible in the centre of the axis, which centre is irregularly heterogeneous in structure, while the rest is distinctly stratified. — The spines are blunt knobs.

The actinopharynx has the normal type with a basal widening and a free border, which is slightly curved upwards. The ectoderm (26 μ) has many small actinopharyngeal glandcells, but also a very large number of deeply staining glandcells of the entodermal type, contained in a lower level of the ectoderm. The mesogloea (1 μ) and the entoderm (7 μ) are the same as in the other parts of the polyp.

Mesenteries. Only the distal part of the primary transversal mesenteries is visible. The rest of the mesenteries is not discernible. The entoderm of the transversal mesenteries (7 μ) increases to 10 μ near the mesenterial filaments. There is a very large number of deeply staining glandcells in the remaining part of the entoderm. There are no musclefibres and no mesogloeal lamellae; the mesogloea is less than 1 μ thick.

The mesenterial filaments are unbranched, or at the utmost once forked, and straight. They are found along the primary transversal mesenteries only. They are oval in section, with their broad side attached to the mesenteries, which are narrower at this place, while they were broader at first. There is no pigmentation. The deeply staining glandcells of the actinopharyngeal ectoderm are also entirely absent over large distances of the filaments. In some places the larger type of glandcells occurs, which was also present in the actinopharyngeal ectoderm. The lack of pigmentation and of nearly all glandcells results in the striking feature that the filaments are hardly stained, while the mesenteries are very deeply stained, just the reverse of the normal condition in other species and genera.

There are no reproductive organs to be found.

24. *Stichopathes solorensis* sp. n. (Pl. VI, fig. 11).

Tentacles. The ectoderm (70 μ) is somewhat variable in thickness. The numerous nematocyst-batteries are to be found not only on the top of the papillae but also in the intervening grooves. They are surrounded by a small number of deeply staining glandcells, which

may be more numerous locally. The nervous layer is almost in contact with the mesogloea. There are no musclefibres worth mentioning. The mesogloea (20 μ) is variable in thickness. There are sporadical oval or round cells and there may also be transversal fibres between ectoderm and entoderm, but not many. The entoderm (56 μ) has an indistinct nervous layer, but no musclefibres. There are not many glandcells; they are principally of the hyaline type.

The BODYWALL, the layers of which are resp. 56, 14 and 42 μ thick, has the same structure as the tentacles. The ectoderm contains a greater number of hyaline glandcells and nematocysts, which may be single or collected in little groups of a few only. The entoderm has a somewhat greater number of deeply staining glandcells than the tentacular entoderm. The layers of the ORAL CONE are thicker.

The AXIS-epithelium is lost for the greater part. The layers are resp. 4, 7 and 15 μ.

The ACTINOPHARYNX does not descend much below the base of the oral cone. The lumen is slit-like. The ectoderm, which is very rich in actinopharyngeal glandcells, is curved outwards at the mouth as a lip. There is no pigmentation. The ectoderm is sub-regularly folded, one fold at each connective point of a mesentery, and one in the intervening space between two connective points. At the sagittal ends there is only a single triangular fold between the two sagittal mesenteries. The folds are 125 μ thick, while in the grooves the ectoderm is only 60 μ. The folds increase in number in the lower part of the actinopharynx. At the base of each fold the mesogloea is thickened, and the epithelial cells radiate from here. There is a large number of hyaline glandcells, especially in the deeper layers of the ectoderm. There are very distinct longitudinal musclefibres. — The mesogloea, 7 μ thick, increases to 21 μ at the base of the ectodermal folds. The entoderm (25 μ) has circular musclefibres, which are more strongly developed than the ectodermal muscle-system. The entodermal structure is the same as in the bodywall, but the glandular elements are rather scarce.

The MESENTERIES, which are normal in number, bear unilateral mesogloeal lamellae with slightly developed longitudinal musclefibres. They are not to be found on the primary sagittal mesenteries. On the primary transversal mesenteries the musclefibres are situated on the same side of both mesenteries; on the secondary ones the musclefibres are found on those sides which are averted from the primary transversal ones.

In tangential sections of the oral cone the mesenteries sometimes show a bilateral system of musclefibres, just as is the case in Pl. III, fig. 8, according to the part of the mesentery being nearer the bodywall or nearer the actinopharynx. In those parts of the mesenteries, which are farthest from the polyp-centre the musclefibres on both sides of the mesentery are parallel with one another. — The secondary mesenteries descend a little more deeply on the actinopharyngeal side than on the side of the bodywall.

The MESENTERIAL FILAMENTS are single-lobed and to be found along all the mesenteries, but along the primary transversal mesenteries only they are convoluted and branched, especially near the free border of the actinopharynx. There is no pigment. They are encased in a cup-shaped entoderm as in Pl. II, fig. 6.

REPRODUCTIVE ORGANS (Pl. VI, fig. 11). There are ova in the primary transversal mesenteries. They are large and not numerous. They fill the greater part of the gastral cavity, but

yet there never are more than 3 or 4 to be seen in one vertical cross-section. — Their diameter is 250 μ. Each ovum is surrounded by a firm mesogloeal capsule, 4 μ thick and more at the joining of the capsules.

25. *Stichopathes gracilis* (Gray) emend. (Pl. VI, figs. 8 and 12).

Tentacles. The ectoderm varies in thickness around 60 μ; the nematocyst-batteries are surrounded by deeply staining glandcells. There are only a few hyaline glandcells. The nervous layer lies at a very low level. There are no longitudinal musclefibres. The mesogloea is about 40 μ thick (!). There are rather numerous transversal fibres from ectoderm to entoderm; these fibres may be branched. The entodermal side shows circular ridges. The mesogloea is homogeneous, without any cells. The entoderm contains only a few deeply staining glandcells and also only a few hyaline ones. There are no musclefibres.

The bodywall is badly preserved. It has the same structure as the tentacles, but the nematocyst-batteries are absent. The mesogloea is yet 30 μ, but the other layers are decidedly thinner than in the tentacles. In the oral cone however, they are thicker and richer in glandular elements, especially in deeply staining glandcells. There is an interzooidal septum, without secondary ones. The axial layers are very thin.

Actinopharynx. The ectoderm is folded with mesogloeal thickenings at the bases of the folds. The actinopharyngeal glandcells are rather abundant; also the hyaline ones. There are very slightly developed longitudinal musclefibres. A pigmentation is to be found only in the lowest part of the actinopharynx, in the immediate neighbourhood of those sides where the primary transversal mesenteries are attached. — The mesogloea is thin, and it contains a large number of fibrillae and oval cells. The entoderm is of the same structure as elsewhere.

The mesenteries have nothing remarkable in their structure except some stellate connective tissue cells in the mesogloea of the primary transversal mesenteries near the bodywall. In the top of the oral cone the mesenterial mesogloea is very thick. The mesenterial musclesystem is well developed, so that there can be no doubt about its exact position. The system of these longitudinal musclefibres is given in fig. 260; on the primary sagittal mesenteries they are found on the averted sides of the mesenteries. On the secondary mesenteries they are directed towards the primary transversal mesenteries and on the latter they are found on both on the same side of the mesentery.

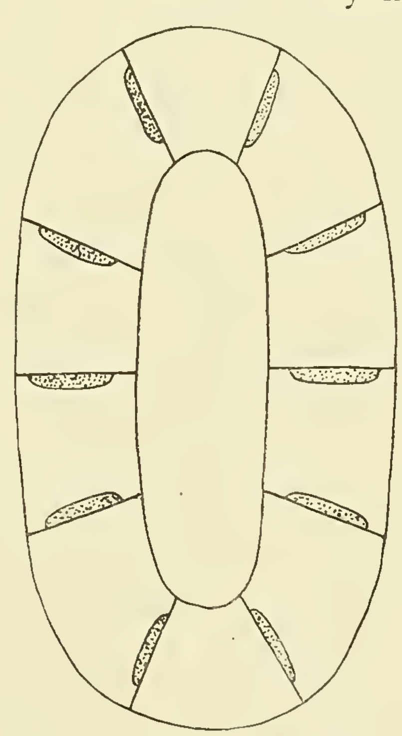

Fig. 260. *Stichopathes gracilis* (Gray) emend. System of the longitudinal musclefibres on the mesenteries.

The mesenterial filaments are highly branched along the primary transversal mesenteries. They contain pigment.

Reproductive organs. The fertile part of the primary transversal mesenteries, which are the only ones containing testes, is folded, especially in the peripherical part of the mesentery (Pl. VI, fig. 8). In the higher part of the oral cone this fold is again united with the mesentery

to an entirely shut canal, which is free from the mesentery in its upper part (Pl. VI, fig. 12). The testes are enclosed in mesogloeal capsules. Almost all the testes are unripe and contain spematocytes; in one single place only there are ripe spermatozoa in part of one of the mesenteries. They are like those in *Eucirripathes Rumphii*.

PARASITES. Symbiotic Algae are rather abundant in the entoderm of the tentacles, the actinopharynx and other parts, but also in the actinopharyngeal ectoderm, though less abundant.

The polyps of a second colony differ from the preceding colony in the strikingly swollen mesogloea; it is obvious that this thickness varies to a very high degree through preservation. Ectoderm and entoderm have disappeared for the greater part; they are relatively thin, compared with the mesogloea. The mesogloea is homogeneous with rare traces of fibrillae. The thickness is at the tentacular base 280 μ and over!; in the oral cone and in the bodywall 100 μ; in the actinopharynx $\pm$ 15 μ; in the mesenteries 20 μ. The lumen is rather small; the tentacular lumen is only slightly more than the mesogloeal thickness. The shape of the actinopharynx is rather curious; in one polyp it is sagittally elongated and in the neighbouring polyp transversally elongated. — The mesenterial muscle-system is quite the same as in the other colony, but no musclefibres are to be found on the sagittal mesenteries. The mesogloeal lamellae are basally fused, in groups.

26. *Stichopathes saccula* sp. n. (Pl. VI, fig. 13; Pl. VII, fig. 2).

TENTACLES. The ectoderm (70 μ) has nematocyst-batteries, surrounded by a small number of deeply staining glandcells. The nervous layer is at a normal depth. There are very slightly developed longitudinal musclefibres. The mesogloea (8 μ) is a homogeneous layer with very rare fibrillae and with circular ridges on the entodermal side. The entoderm (55 μ) does not contain any deeply staining glandcells, but only hyaline ones. A nervous layer is not to be seen, but there are circular musclefibres.

BODYWALL. The ectoderm (40 μ) is the same as in the tentacles, but there are no nematocysts, while the number of deeply staining glandcells is large. There are very slightly developed musclefibres, but their direction is not to be made out. The mesogloea (8 μ) and the entoderm (40 μ) are both the same as in the tentacles. The ORAL CONE has a wall of the same thickness, but there are no deeply staining glandcells in the ectoderm. There are circular musclefibres in the entoderm; even the entodermal side of the mesogloea has small lamellae for these musclefibres. There is an interzooidal septum with some slightly developed secondary septa, which consist of mesogloea only, while the entoderm of the bodywall does not follow these mesogloeal irregularities, but covers them with a smooth surface as in Pl. III, fig. 2. — There is a basal septum like that of Pl. V, fig. 6, but it is complete over the entire breadth of the polyp. It is fixed to the lower border of the primary transversal mesenteries, which border is free in other species. This septum is easily to be distinguished from the axis-layers, since the basal septum entirely merges into the bodywall at the polypar limits.

The AXIS-layers are lost for the greater part of them; ectoderm and mesogloea are

very thin, but the entoderm is as thick as in the bodywall. The connecting septum is short, broad and irregular.

Actinopharynx. The wall is folded at the connective points of the mesenteries; the folds at the sagittal ends of the slit-like lumen widen in the lower part of the actinopharynx. The ectoderm contains a large number of actinopharyngeal glandcells but not many others. The upper part of the actinopharynx has no pigment but in the lower part a brown pigment is found in rather a large quantity, but not so large as to cover the structure of the epithelium. There is no lip. The mesogloea is very thin; the entoderm is of the same structure as in the bodywall, and it contains slightly developed circular musclefibres.

The mesenteries are of normal number. Their entoderm is 26 μ, their mesogloea 4 μ. The course, which the pairs of secondary mesenteries take, is rather curious; in the toppart of the oral cone these mesenteries extend from the bodywall to the actinopharynx but lower down they leave the bodywall and extend between the actinopharynx and a lateral fold of the actinopharynx (Pl. VI, fig. 13). — There is a mesenterial musclesystem; I was obliged, through the incompleteness of the series of sections, to make out the system from several sections. In horizontal sections through the basal part of the oral cone, at the lowest part of the actinopharynx, one of the secondary mesenteries shows its longitudinal musclefibres in that part, which is nearest the actinopharynx, while in the same section that part of the same mesentery, which is nearest the bodywall shows its transversal musclefibres at the other side. For this reason the following system of longitudinal musclefibres is a little dubious. On one of the sagittal primary mesenteries I saw musclefibres at the side turned towards the other mesentery of the same pair. — On both the primary transversal mesenteries they are found at the same side; one of the pairs of secondary mesenteries has its longitudinal fibres turned towards the primary transversal ones, while the other pair has those fibres on the side averted from these transversal mesenteries.

The mesenterial filaments are straight along the primary sagittal mesenteries, but convoluted along the primary transversal mesenteries. They contain pigment.

Reproductive organs. There are only testes to be found in the primary transversal mesenteries. The testes are oval with a longest diameter of 120 μ. Each is surrounded by a very thin mesogloeal capsule, much less than 1 μ thick. All the testes are in the same stadium; they are ripe and filled with a bundle of spermatozoa, surrounded by spermatocytes. The heads of the spermatozoa are spread out fan-shaped, while the ends of their tails are crowded together. The tails in all the testes of an entire mesentery are turned in the same direction (Pl. VI, fig. 13), viz. towards the mesenterial mesogloea. — Further it is to be remarked that the testes are found on one single side of the mesentery, which is unilaterally swollen; so the mesentery is usually S-shaped (fig. 261 *A*). I have noticed the same fact with the ovaria of other species (cf. the primary transversal mesenteries and also the secondary mesenteries in Pl. V, fig. 7). In his schematical figures Brook draws a bilateral swelling of the fertile mesenteries, but this may be explained by the mesogloea not always being easily distinguished in these mesenteries. The mesogloea is not rectiliniarly stretched as in fig. 261 *B*, but the pseudo-bilateral swelling may be explained with a unilateral one as in fig. 261 *A*, but to such a degree

as to bring the middle part of the sterile entoderm partly in contact with the sterile entoderm near the bodywall (fig. 261 *C*). In SCHULTZE's and ROULE's figures the **S**-shape is given, but not the direction of the mesogloea. — The mode of origin of the testes was especially to be followed in that part of the mesentery, which adjoins the bodywall or the actinopharynx. Here the mesogloeal capsule of the testes-vesiculae is in connection with the mesenterial mesogloea, in such a way that the capsule remains an open pocket. The surface of the mesogloea is interrupted above the opening, through which the tails of the spermatozoa project outwards, at least across the mesogloeal limit, and halfway the thickness of the entoderm at the other side of the mesentery. The vesiculae numbered 1, 2, 3 in Pl. 7, fig. 2 show this phenomenon, while the fourth is not attained in its median plane. — In my opinion the process is as follows: at first the primordial germcells are to be found in the entoderm on one side of the mesentery, viz. that side, which is the narrow unchanged one in the fertile mesentery lateron. The mesogloea invaginates below these cells and the germcells are found in this invagination, which is the capsule described above, surrounded by the entoderm of the other side, which becomes swollen to give room for the capsules. Since there were no stadia to be found with an entirely shut capsule, it is probable that the invagination remains open during the entire spermatogenesis. When the spermatozoa are ripe, they find an exit through the existing opening of the capsule, as is demonstrated by Pl. 7, fig. 2.

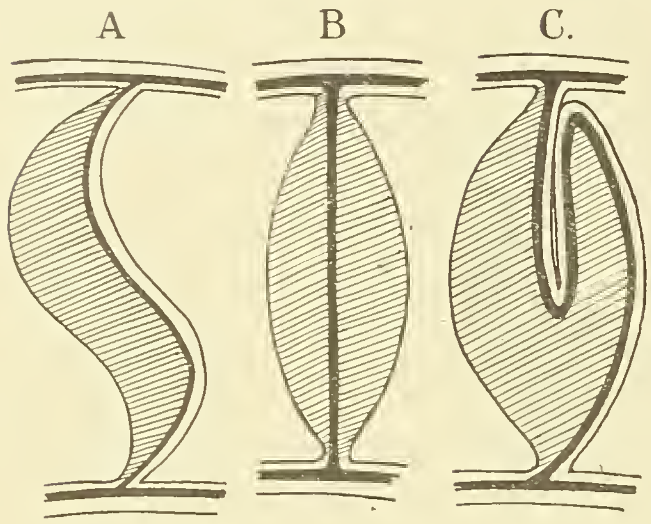

Fig. 261. Schemata of fertile transversal mesenteries in horizontal section. Black: mesogloea; white: ectoderm and sterile entoderm; hatched: fertile entoderm. *A* the unilaterally fertile entoderm is swollen and bends the mesentery **S**-shaped; *B* hypothetical bilaterally fertile entoderm; *C* seemingly bilaterally fertile mesentery, through unilateral swelling to an exceeding degree: usually the mesogloea in the fertile part is very inconspicuous.

The entoderm, which gives rise to the germcells, is situated on the same side as the longitudinal musclefibres, higherup in the mesentery. So the testes in their fertile state are found on the same side of the mesentery as the transversal musclefibres. I do not know whether there are one or several primordial germcells in one single capsule, but the latter case is more probable. — The ovaria have the same mode of origin, but now there is always one cell in a capsule. Above each ovum the mesogloea is interrupted in the same manner as with the testes (cf. Pl. I, fig. 7) and the mesentery is also unilaterally swollen.

The entire polyp, perhaps even the entire colony, is in the same stadium of ripeness.

PARASITES. There are symbiotic Algae to be found in the entoderm of the bodywall and even of the mesenteries between the testes. There is also a unicellular parasite of the same type as in Pl. III, fig. 3, but much larger. It is found in the entoderm of the tentacles, near the peripheric connective point of tentacle and bodywall. This parasite is oval in shape; the longest diameter is parallel with the mesogloea, the short axis of 100 μ is at right angles with the mesogloea. Its plasma is full of vacuoles. The entoderm is not found above the parasite (or perhaps in a very thin layer); it is less than 10 μ thick below the parasite, but right and left it gets its usual thickness. That side of the parasite, which is in contact with the

entoderm, is not smooth but sinuous and very much like pseudopodia, whether for fixation or nutrition or both.

27. *Stichopathes ceylonensis* T. & S.

Tentacles. The ectoderm (85 μ) contains a large number of nematocyst-batteries surrounded by deeply staining glandcells, on the top of the papillae but also in the intervening space. The upper layer of the ectoderm contains many oval deeply staining glandcells, with granular contents in the cell-periphery. Homogeneous glandcells, which do not stain so deeply, are found in the lower half of the epithelium. The nervous layer is separated from the mesogloea by a clear space. There are longitudinal musclefibres. The mesogloea (28 μ) is homogeneous, with very rare transversal fibrillae. The entoderm (50 μ) contains circular musclefibres and only a few deeply staining glandcells.

One of the sagittal tentacles is somewhat deformed. While the base and the top have the normal lumen, this lumen is absent in the middle part of the tentacle. The entoderm has altogether disappeared, perhaps through parasitic influence. The beginning of such a reduction might be the same as in *Stichopathes saccula* a. o. The mesogloea is changed into a double lamella, surrounded by the ectoderm.

Bodywall. The ectoderm (56 μ), the mesogloea (14 μ) and the entoderm (50 μ) have the same structure as in the tentacles, but the musclefibres and the nematocyst-batteries are absent. The latter however are to be found in the ectoderm of the oral cone. The entoderm of the oral cone contains circular musclefibres. The polyps are separated by an interzooidal septum, 140 μ high, with small secondary mesogloeal lamellae, without corresponding folds in the entoderm.

The thin axial layers are lost for the greater part.

Actinopharynx. The ectoderm (40—80 μ) is folded. It has the same granular glandcells as the bodywall, together with the actinopharyngeal glandcells, which, as usually, are found in the upper half of the ectoderm, leaving a clear space at the surface. — The actinopharyngeal ectoderm forms a lip at the mouth. There are slightly developed longitudinal musclefibres. The pigmentation is entirely absent. The mesogloea is 1 μ thick, which value increases to 10 μ in the lower part of the actinopharynx. The entoderm (30 μ) is the same as elsewhere.

Mesenteries. They are normal in number and structure. The secondary mesenteries descend to the deepest level on the side of the bodywall. The free border of the primary transversal mesenteries is broadened at the polypar periphery, where the mesenterial filaments have come to an end. This broadened border contains a rather large number of oval cells in the thickened mesogloea, just like Pl. I, fig. 10. The longitudinal musclefibres are found unilaterally, supported by mesogloeal lamellae. On the primary sagittal mesenteries these fibres are found on the sides facing each other in the same pair. On the primary transversal mesenteries they are lying on the same side. On the secondary mesenteries they are found on those sides which are averted from the primary transversal mesenteries. In tangential sections of the oral cone the situation of the longitudinal and transversal musclefibres is the same as in Pl. III, fig. 8.

The mesenterial filaments are kidney-shaped and thrice as broad as the mesenteries,

and they are separated from the mesentery by a deep constriction. They are straight along the primary sagittal mesenteries but convoluted and branched along the primary transversal ones. There is no pigment.

REPRODUCTIVE ORGANS. The primary transversal mesenteries contain a small number of testes with a very thin mesogloeal capsule. They are found in that part of the mesentery, which also bears the filaments, and they take up a small part only, near the place, where the mesentery is fixed to the bodywall. The testes are unilaterally distributed on that side of the mesentery, which may bear the transversal musclefibres also. All the testes are in the same stadium of ripeness, filled with a bundle of spermatozoa. The capsule is oval with a long axis of max. 90 μ. Their mode of origin is the same as in the preceding species. — In one of the series of sections a number of ripe testes-vesiculae are lying free in the actinopharyngeal lumen, very near the mouth. They are still surrounded by a thin mesogloeal layer. We cannot decide whether this a normal method of liberating the spermatozoa or whether they are accidentally shifted hither by preservation etc. The latter is probably the case.

PARASITES. There is a large parasite, which fills almost the entire gastral cavity. It is a Plathelminth; the series of sections through the attained polyp is rather bad, since the sections of the parasite do not always remain fixed in the gastral cavity. The following data could be made out: the parasite is long and flat without segmentation. One of the planes is bent, so that the sides of the body are V-shaped. It is covered with a unicellular epithelium with a striped cuticula; there is a subepithelial layer of longitudinal musclefibres; parenchymatose cavities are separated by dorso-ventral musclefibres. Testes and ovaria are arranged bilaterally. The digestive canal is without an anus; it begins with a very muscular proboscis, projecting on the middle of the ventral side. Near this proboscis there is a brain with a great number of ganglion cells. There are six longitudinal nerves, two pairs on one side of the body and one pair on the opposite side. There are two strong nerves besides, which go laterally from the brain towards the sensory organs. There are paired openings for the two penes, which are to be seen through a great part of the body as horny, slightly curved tubes with basal muscle-system. One single parasite is found in several neighbouring polyps, for its body is indented by an interzooidal septum.

28. *Stichopathes semiglabra* sp. n. (Pl. VI, fig. 4).

The ectoderm and the entoderm have disappeared and the mesogloea only remains, together with the actinopharyngeal ectoderm. — This ectoderm (58 μ) is rich in actinopharyngeal glandcells, with a few of a larger type. There is no pigment; the longitudinal musclefibres are slightly developed. The mesogloea bears lamellae, which project far into the actinopharyngeal lumen (Pl. VI, fig. 4); in the upper part of the actinopharynx these lamellae (14 μ long) are to be found at the sagittal ends, but at a lower level they become more numerous and they project farther (28 μ) into the lumen.

There are ripe TESTES in the gastral cavity, near the primary transversal mesenteries, but probably freed by the maceration of the tissues.

There is a BASAL SEPTUM across the entire breadth of the polyp at the polypar periphery; it is attached to the usually free border of the primary transversal mesenteries.

The mesogloea, which is a homogeneous layer, is very thick, viz. tentacles: at the top 7 μ, at the base 66 μ; bodywall: ± 13 μ but very variable; oral cone: max. 25 μ; actinopharynx: 35 μ; mesenteries: 4 μ or less; basal septum: 7—8 μ.

29. *Stichopathes aggregata* sp. n. (Pl. VII, figs. 5, 6 and 7).

TENTACLES. The ectoderm (40 μ) is papillose and contains a small number of nematocyst-batteries, surrounded by a large number of deeply staining, homogeneous glandcells, which are also present in other parts of the ectoderm. The nervous layer is separated from the mesogloea by a clear space. There are no musclefibres or they are only very slightly developed. The mesogloea (10 μ) is a homogeneous layer, with circular ridges on the entodermal side. The entoderm (20 μ) contains no other glandular elements besides the hyaline glandcells. There are no musclefibres.

The BODYWALL has layers of the same structure, minus the batteries, as the tentacles; the thickness is resp. 20, 3 and 10 μ. The layers are thicker in the ORAL CONE viz. 26, 10 and 13 μ. The polyps are separated by an interzooidal septum.

The AXIS, a very thin-walled tube with a very wide lumen is broken in most of the sections, tearing up the tissues rather badly. — The epithelial layers are resp. 7, less than 1 and 5 μ. The ectoderm is thicker at the base of the spines, thinner at their top; its thickness increases towards the top of the colony.

ACTINOPHARYNX. The ectoderm (26 μ) has actinopharyngeal glandcells only. There is no pigment, even in the lower part of the actinopharynx. The ectoderm is very deeply folded. The mesogloea is less than 1 μ; the entoderm (13 μ) is the same as elsewhere.

The MESENTERIES are normal in course and number. There are no musclefibres. The entoderm is 7 μ and the mesogloea less than 1 μ. The secondary mesenteries descend to a slightly lower level at the actinopharyngeal side.

The MESENTERIAL FILAMENTS are straight along the primary sagittal mesenteries. Along the primary transversal ones they are straight at first, but at a little distance from the actinopharyngeal border the filaments get convoluted and branched (Pl. VII, figs. 5, 6 and 7). There is no pigmentation.

REPRODUCTIVE ORGANS. They are absent and in connection with this it is remarkable that the gastral cavity is very large and roomy when compared to the axis-diameter. While in other species this cavity is a narrow slit only, it is very wide here (Pl. VII, fig. 7). For this reason the polyps are cushionshaped, which is accentuated by the gastral cavity narrowing distinctly at the periphery of the polyp (Pl. VII, fig. 6). The absence of reproductive organs in this case is a proof of the incorrectness of the opinion of some authors as if the different size of the polyps could be explained by the presence or absence of genital products. It is plain that for sure this is not the only factor, if it is one, for here the gastral cavity is a large empty room, only for a very little part filled with mesenterial filaments.

30. *Stichopathes variabilis* n. n. (Pl. VI, figs. 2, 7, 10; Pl. VII, figs. 1, 4, 8, 9, 10).

I was able to make sections through several colonies from various stations. The var. *asperispina* from Saleyer and stations 7, 53 and 260; the var. *longispina* from station 318; the var. *lissispina* from Banda and the var. *lissispina minor* from station 117 were examined. The following description relates to the var. *longispina*, *lissispina* and *lissispina minor* together. It will be followed by the divergations shown by the colonies from the other stations.

Tentacles. The ectoderm (47 μ) contains nematocyst-batteries, surrounded by deeply staining glandcells. There are slightly developed longitudinal musclefibres. The nervous layer is almost in contact with the mesogloea. The homogeneous mesogloea (1—13 μ) has circular ridges on the entodermal side. There are no oval cells, but transversal fibrillae, especially at the base of the sagittal tentacles. The entoderm (35 μ) contains circular musclefibres and a few deeply staining glandcells.

Bodywall. The ectoderm (15 μ) has the tentacular structure, except for the absence of nematocyst-batteries and musclefibres. The mesogloea (7 μ) has rare transversal fibres. The entoderm (7 μ) is the same as in the tentacles, but without musclefibres.

The ectoderm of the oral cone is very rich in deeply staining glandcells and it contains a large number of nematocyst-batteries besides. Its entoderm has slightly developed circular musclefibres. — The polyps are separated by an interzooidal septum.

The axis has very thin epithelial layers. The very thin connecting septum is not always fixed diametrically opposite the oral cone, but slightly laterally. The sheath of the spines is very frequently fused with the bodywall; the entoderm of the spines as well as of the bodywall is thinner in these places. The spines are club-shaped with a narrow stalk. — Towards the top of the colony the axial ectoderm increases in thickness, while the axis itself is only a very thin wall with a wide lumen. At first the ectoderm thickens over two thirds of the circumference, not on the side of the connecting septum, but furtheron towards the colony-top it is everywhere thickened to the same degree. — The extreme apex of the colony is a tube, not exactly circular in section, of ectoderm, mesogloea and entoderm. At a distance of 75 μ below the top, part of the ectoderm invaginates (Pl. VI, fig. 10) and forms a mass, which is somewhat like a mesenterial filament; a large knob of ectoderm is encased in very thin layers of mesogloea and entoderm and joined to the bodywall by a connecting septum of mesogloea and entoderm. The encased ectoderm shows no trace of a horny axis, but furtheron from the colony-top this knob is an irregular entangled mass of ectoderm and of horny matter. This horny matter gets the normal shape of the axis, while the ectoderm arranges itself into a regular cylindrical epithelium (Pl. VII, fig. 8) at a distance of 150 μ below the colony-top. Here the connecting septum is very broad; the entoderm of bodywall and axis are fused over one fourth of the circumference, but soon it diminishes into a very thin septum. At a greater distance from the top the first polyp appears, which is of a normal type, but small.

Actinopharynx. The ectoderm (24 μ) contains many actinopharyngeal glandcells and a few other deeply staining cells. The mesogloea (1—2 μ) and the entoderm (11 μ) have the same structure as elsewhere. There is no pigment. The mesogloea projects in the shape

of high lamellae in the actinopharynx, just as in *Stichopathes semiglabra*, which in other respects is also very much like the species under consideration.

The MESENTERIES are normal in number and course. The secondary mesenteries descend to a subequal level at the side of the bodywall and along the actinopharynx. The mesenterial system of longitudinal muscles is the same as in *Stichopathes ceylonensis*, except for the primary sagittal mesenteries, for which I was not able to make out a muscle-system.

The MESENTERIAL FILAMENTS are very strongly developed along all the primary mesenteries, but not along the secondary ones. They are so much developed as to penetrate into the top of the tentacular lumen. They are single-lobed and without pigment.

REPRODUCTIVE ORGANS. There are testes-vesiculae with a diameter of 70 μ; they are everywhere in the same stadium of ripeness. The tails are crowded in bundles; the heads are arranged in longitudinal rows (Pl. VII, fig. 4). They are found in the primary transversal mesenteries. — It is remarkable that testes are also found in the entoderm of the bodywall near the places of attachment of the transversal mesenteries (Pl. VII, fig. 4), but also at a much farther distance from these mesenteries, even diametrically opposite the mesenteries. In this case there can be no question about an invagination as is the normal course of development in other species, since the mesogloea is much to thick to give in. The growth of the testes makes the entoderm swell, as is shown in Pl. VII, fig. 4, but a mesogloeal capsule, which is present, although very thin, in the normal testes, is absent of course. In the mesenteries the mesogloea is always very thin, so that an invagination is possible; usually the growth will take place towards the place of minor resistance. —

Further it is remarkable that in one of the series testes are found in the ectoderm (!) of one of the tentacles (Pl. VII, figs. 9 and 10). This vesicle is surrounded by a mesogloeal capsule (fig. 9). At first I thought about the possibility of the testes-vesicle being liberated through the mouth and secondarily reaching a flaw of the ectoderm, but Pl. VII, fig. 9 shows clearly that the testes are lying in the ectoderm; below the testes the ectoderm has almost disappeared, while at the left it covers the vesicle. In one of the other sections (Pl. VII, fig. 10) I saw that the mesogloea is interrupted below the vesicle and that some heads of spermatozoa project in the mesogloea and even in the entoderm. My opinion is that these testes have taken their origin in the entoderm of the tentacle, as is described above for the bodywall-entoderm, but now very high in the tentacle, where the mesogloea is much thinner than in the bodywall. So it was possible for the mesogloea to invaginate towards the entodermal side so that the capsule got an ectodermal situation. It is true that in this case the mesogloea of the tentacle in Pl. VII, fig. 10 ought to be connected with the mesogloeal capsule, but this could not be made out with certainty so that I omitted this connection. — I do not know any other way of explaining this strange situation.

PARASITES. In several polyps I found the same unicellular parasite as in *Stichopathes saccula* a. o. It is found in the entoderm of the bodywall near the connecting septum of the axis. The entoderm below the parasite has entirely disappeared, while the mesogloea is pressed outwards knob-shaped. This last fact is to be explained by the axis, which is almost in contact with the bodywall, resisting the inward growth of the parasite, which is much thicker than the entoderm. The surface of the parasite does not show pseudopodial lobes.

The colonies of var. *asperispina* from Saleyer have an anatomical structure, which is rather like that of *Eucirripathes nana* v. P. (cf. Pl. I). The nervous layer of the tentacular ectoderm does not lie at so deep a level. The mesogloea is so thin that there is hardly any homogeneous layer between the bases of ectoderm and entoderm. The ectoderm of the entire bodywall, and not only of the oral cone, is very rich in deeply staining glandcells, and it contains fine musclefibres, the direction of which is uncertain. — The axis-entoderm is of the same thickness as in the bodywall (60 μ!). The actinopharynx does not stain so deeply as the bodywall, since its structure is the same as in Pl. I, fig. 19. The actinopharyngeal ectoderm forms a lip; there may be brown pigment in its lower part. The mesenteries miss mesogloeal lamellae or musclefibres. The mesenterial filaments occur along all the mesenteries, even along the secondary ones. They are slightly pigmentated, but the pigment may be entirely absent also. The unicellular parasite of the preceding colonies is also present, encased in the entoderm of the bodywall. The colony-top gives the same sections as in the described specimen; the place, where the first polyp originates, has an ectoderm very rich in deeply staining glandular elements, while the surrounding ectoderm is decidedly less rich in these cells. The polyps are small in this top-part, especially their tentacles; their oral cone is of the same height as in the adult polyps. The actinopharynx is only a very narrow slit. The young spines are club-shaped and the axis-ectoderm is very much thicker at their base; their mode of origin is schematically given in Pl. VI, fig. 2. The axis-wall makes a fold, cylindrical in shape; this first layer is everywhere of equal thickness. This is also the case with the second layer, which is at the base of the spine not in contact with the first layer. The third layer is very thin in the basal part of the spine but very thick at its top, so that this layer gives the young spine its club-shaped appearance. In their further growth the spines gradually get a more normal shape. The first fold of the axis-wall remains open at first so that there is a lumen, in connection with the axial lumen and often filled with the intima of the axis. The axis-wall is 5—9 μ thick with a lumen-diameter of 250 μ.

The polyps of station 260 have pigment in the actinopharynx, but only in its lower part; the mesenterial filaments contain pigment to a very large quantity; besides there is pigment to be found in the entoderm of the bodywall, right and left of the transversal mesenteries, but not in the place of attachment itself; the entoderm of the tentacles may contain pigment, but especially at the surface and less in the deeper part of the epithelium. The bodywall has a few deeply staining glandcells or none at all, except in the oral cone, where they are very much crowded. The mesenteries have unilateral mesogloeal lamellae for musclefibres, but none of the several series gives a clear view of the musclesystem. — The mesenterial filaments are to be found along the primary transversal mesenteries only. The testes have a pear-shaped capsule, the stalk of which is in connection with the mesenterial mesogloea. This stalk has no lumen, so that I saw no persistent opening as in *Stichopathes saccula*. Their mode of origin however probably is through invagination of the mesogloea. All the bundles of tails are directed towards the mesogloea of the mesentery. — There are some symbiotic Algae in the actino-pharyngeal ectoderm.

The polyps of station 7 have no musclefibres in their tentacular ectoderm. The bodywall-

ectoderm contains only a few deeply staining glandcells, except sometimes in the oral cone. The actinopharyngeal ectoderm is rich in glandcells and stains much more deeply than the bodywall, as is the normal case in other species. There is a broad lip of actinopharyngeal ectoderm (Pl. VI, fig. 7); the oral cone is constricted at its base. There is no pigment anywhere. The mesenteries have no musclefibres or mesogloeal lamellae. The mesenterial filaments occur along the primary transversal mesenteries only, and they are straight and unbranched.

The polyps of station 53 have a small number of nematocyst-batteries in their tentacular ectoderm, and a large number of supporting cells. This ectoderm contains longitudinal musclefibres. The bodywall-ectoderm has locally crowded, deeply staining glandcells, which are very numerous in the oral cone, which is basally constricted. The actinopharynx-ectoderm forms a narrow lip. There is no pigment in any part of the polyp. The mesenterial musclesystem is absent or too slightly developed to permit a clear view of the musclesystem. The mesenterial filaments are found along all the primary mesenteries, convoluted along the transversal ones. There are symbiotic Algae in the ectoderm of the tentacles, the oral cone and the bodywall (Pl. VII, fig. 1); they occur in the entoderm also but very rarely. At the top of the colony the axis-ectoderm (Pl. VII, fig. 1) is thickened to 37 μ; it is a cylindrical epithelium with basal nuclei, which are large, oval or round, and not very deeply staining. The entoderm (12 μ) is a cubical epithelium with smaller, more deeply staining nuclei. The nuclei of the bodywall-ectoderm are of the small, dark and elongated type, which is typical for ectoderm. The formation of the axis takes place in the same way as in the type of this species.

The following tabel gives a review of the numerical data of the thickness of the various layers in the examined colonies.

Station and Variety		Tentacles			Bodywall			Oral cone			Actinopharynx		
		ec	*me*	*en*	*ec*	*me*	*en*	*ec*	*me*	*en*	*ec*	*me*	*en*
var. *asperispina*	Saleyer	50	4	35–44	70	13	60	70	13	60	70	13	60
	7	33	4	16	10	3	6	17	4	7	24	1	6
	53	50	4	20	50	4	20	50	4	20	20	1	7
	260	40	4	30	15	4	10	40	4	30	33	4	15
var. *longispina*	318												
var. *lissispina*	Banda	47	1–13	35	15	7	7	40	13	7	24	1–2	11
var. *lissispina minor*	117												

The mesenterial entoderm varies from 6—12 μ, its mesogloea from 1—2 μ; the axis-ectoderm 3—6 μ, its mesogloea 1 μ or less, its entoderm 3—7 μ.

REVIEW OF MICROSCOPICAL ANATOMY.

The results of microscopical examination of the various species have many points in common with Brook's results. However there are important deviations from or complements to Brook's data to be found, especially in the mesogloea, in the mesenteries, as well their

number as their muscle-system, in the sexual cells, the musclesystem in general, etc. Apart from the differences between the described species, which differences are to be found on almost every point of the microscopical anatomical characters as the structure of the epithelial layers, the musclesystem, the course and the number of the mesenteries, the shape of the actinopharynx, the mesenterial filaments, etc. the following characters are of a more or less general value; however these characters are very unstable.

TENTACLES. Ectoderm. Hardly any element may be mentioned as always present. As a rule the epithelial layer contains many ciliated cells; the glandcells may be of the hyaline type or of the deeply staining type. The latter are crowded together in groups and of a lighter shade, or they are independent and very deeply staining with granular or homogeneous contents. The latter types are usually to be found around the nematocyst-batteries. Next to species with hyaline glandcells only (*Eucirripathes Rumphii*, *Sibopathes gephura*), other species are to be found with a few deeply staining glandcells around the batteries only, or with this same type also in the rest of the ectoderm, either sparingly distributed or much crowded or with every type of glandcells (*Eucirr. spiralis* var. *aphanipathoides*), etc. in every combination. Several species have nematocyst-batteries of a conical shape, usually with one type of nematocysts, rarely with two types; the batteries are found on the top of the ectodermal papillae, but sometimes in the intervening ridges also. — Below these batteries there is an accumulation of nuclei; the batteries themselves may be surrounded by deeply staining glandcells or not. There are no single, independent nematocysts. While there are species without nematocyst-batteries, there are other species, where these batteries are developed to such an extent as to fill almost the entire ectoderm. The battery may take up part of the thickness of the ectoderm, but they may also reach to the base of this layer (*Schizop. affinis*). In rare cases the ectoderm contains a large quantity of pigment (*Euant. myriophylla*). The ectodermal nuclei are always deeply staining, small and oblong.

Usually the nervous layer is easily to be distinguished, but on a very variable depth in the ectoderm, sometimes in contact with the mesogloea, sometimes separated from the mesogloea by a clear space. In the same species both modes of occurrence may be found (*Euant. dichotoma*, *Aphanip. Sibogae*). Rarely nuclei are to be observed in this layer, as an indication of ganglia-cells. The muscular layer, which is entirely absent in some species, may be more or less strongly developed with other species. It consists of longitudinal musclefibres, which are often supported by small mesogloeal lamellae.

Mesogloea. Several species have a homogeneous mesogloea. In other species this layer repeatedly contains connective-tissue cells. Usually these cells are oval or round but never stellate. They are especially to be found in the thicker parts of the mesogloea while the thinner parts in the same species may be homogeneous. These cells are of ectodermal origin, as was clearly visible in *Sibopathes gephura*, where they are also found in the base of the ectoderm, and where the connecting canals through the mesogloea towards the cells are still in existence. Besides there are repeatedly fibrillar connections between the ectodermal and the entodermal base, especially at the base of the tentacle, where the tentacle-wall is continued by the bodywall. These fibres may show swellings. Usually their course is straight, seldom

irregular. They may be also parallel or subparallel with the ectodermal base. In rare cases there are thicker bundles, which may be artefacts however. — The thickness of the mesogloea is not so typical for a genus, as is supposed by ROULE. There is no relation between the support, which may be given by the spines or not, and the mesogloeal thickness. With *Eucirr. Rumphii* the thickness of ectoderm and mesogloea is respectively 115 μ and 7 μ, while with *Eucirr. translucens* these values are resp. 105 μ and 140 μ. According to ROULE's supposition the latter species, which sometimes even has a much thicker mesogloea, ought to have very slightly developed spines, while the figures in the systematic part show the spines of *Eucirr. translucens* as much as thrice as long as with *Eucirr. Rumphii*. But apart from this fact, the very unequal thickness of the mesogloea in the different species of one and the same genus is not well in accordance with the supposition that unbranched colonies or colonies without spines or with small spines have a thicker mesogloea than branched genera or colonies with well developed spines. *Aphanipathes Sibogae* has a thick mesogloea; *Sibopathes gephura* combines a very thin mesogloea with very small spines and the same is true for *Bathypathes patula* a. o. — The mesogloeal surface may have small lamellae for ectodermal and entodermal musclefibres; the entodermal side often shows circular ridges, especially near the base of the tentacle, sometimes bearing secondary ridges.

Entoderm. The epithelial layer contains many ciliated cells and especially hyaline glandcells, but no deeply staining glandcells or a few only. The entodermal nuclei are larger and less stained than the ectodermal nuclei, and round. The number of deeply staining glandcells is large in *Sibop. gephura* but possibly this fact is to be connected with the absence of an actinopharynx. *Parant. columnaris* also shows a large number of alveolar deeply staining glandcells in the entoderm. — The muscular layer, which in many cases is entirely absent, consists of circular fibres, which are less developed than the ectodermal system. The fibres may be supported by mesogloeal lamellae.

BODYWALL. In the main the structure of its layers is the same as of the tentacles, but the nematocyst-batteries may be entirely absent, except in some species such as *Sibop. gephura*, *Schizop. affinis*, *Euant. plana*, etc. where their number is even very large. Usually the nematocyst-batteries are very numerous in the oral cone, especially near the mouth, just like the deeply staining glandcells, but not as a rule. Very rarely single nematocysts are found in the ectoderm. The deeply staining glandcells may be locally entirely absent, and locally crowded as palisades, in one and the same species. The glandular elements in the oral cone are often more developed than in the rest of the bodywall, but usually less than in the tentacles. The entoderm (*Eucirripathes*-species) as well as the ectoderm (*Euant. myriophylla*, *Stichop. variabilis* var. *asperispina*) may contain accumulations of pigment here and there, which in other cases otherwise are often characteristic of the actinopharyngeal ectoderm and the mesenterial filaments. — The muscle-system is rarely well developed; the ectoderm may contain longitudinal fibres and the entoderm, especially of the oral cone, circular fibres.

Between the polyps an interzooidal septum may often be found, with several incomplete septa on both sides. These secondary septa consist of mesogloeal lamellae only, however without the entoderm following these lamellae (*Cirrip.*, *Hillop. ramosa*). These interzooidal septa remain

free from the axial epithelium, except with some species (*Eucirr. contorta*, *Sibop. gephura*, *Aphan. Sibogae*), where this septum is fused, in its lower part, with the axial entoderm and mesogloea, so that the polyps are completely separated one from the other. In the same *Eucirripathes*-species the interzooidal septum forms a more or less complete basal septum between the gastral cavity and the axis. This basal septum is complete in *Stich. saccula*, while *Stich. semiglabra* has an incomplete basal septum, which is only complete at the polypar periphery. The basal septum may be fused with the free border of the primary transversal mesenteries.

Axis-epithelia and axis. The axial ectoderm as well as the entoderm usually are thin layers only; the axial entoderm has the same structure as in the bodywall, except for the usual absence of glandular elements. In *Sibop. gephura* this entoderm contains large, deeply staining glandcells and in *Euant. myriophylla* many hyaline glandcells. The mesogloea is homogeneous. The axial ectoderm is in structure very like the entoderm, e. g. as to the shape of the nuclei. Rarely there are some deeply staining elements in this ectoderm.

The axial sheath is connected with the bodywall by a connecting septum of mesogloea with entoderm, usually diametrically opposite the mouth. The septum is asymmetrically placed with some species, either always, or partly in a colony (*Bathyp. patula*, *Stichop. variabilis*). The septum is everywhere subequal in breadth, or triangular so that the base is found on the axial side, or double-funnelshaped, with its broad sides at the axis and at the bodywall. Over some distance the septum may be double. In the neighbourhood of the colony-top the septum broadens and is shorter, so that it is more like a fusion between the axial sheath and the bodywall over the greater part of the circumference. — In normal conditions the septum may also be more like a fusion as is found at the top of the spines. — There are a few microscopical indications, or none at all, of the longitudinal groove, which often may be found along the back of the axis at the macroscopical examination; *Schizop. affinis* and *Bathyp. patula* show a groove with thinner ectoderm and mesogloea, in the bodywall opposite the connecting septum, while also, but problematically, an invagination-opening is found between the doubled connecting-septum in *Schizop. affinis*. — The spines are entirely covered with the axial sheath; the axial ectoderm is the thickest at the base of the spines; the layers are very thin at the apex of the spines. When the spines are long or the gastral cavity very narrow, the spines repeatedly come so near the bodywall that the mesogloea and the entoderm of the axis and of the bodywall are fused together. The same fact is possible for the spinal sheath and the mesenteries, and also the interzooidal septum. — Sometimes the free border of the primary transversal mesenteries is entirely fused with the axial sheath. The axis itself is composed of concentric layers with different refraction-index; in the axial lumen the fibrous or cellular intima lies against the horny layers; in one case the axis is massive, without axial lumen. — The young spines are massive in several species (*Schizop. affinis*, *Bath. patula*, *Euant. myriophylla*) but in other species they are hollow and usually club-shaped. This cavity may be in connection with the axial lumen (*Euant. dichotoma*, *Stich. variabilis*). Probably the young spines originate through an outward folding of the thin axial wall; so the diminuition of the diameter of the axial lumen at a greater distance from the top may also be explained by this. — The cavity in the spines disappears in a later state, probably through the pressure of the surrounding growing layers. The spines loose their club-shape and so

the basal growth of the spines is exceedingly more than the apposition at the apex of the spine, possibly in connection with the greater thickness of the axial ectoderm at the base of the spines.

Origin of the axis. The invagination, which will yield the epithelial layers of the axis, may originate on two places, either on a little distance below the colony-top (9 μ in *Euant. dichotoma*, 75 μ in *Stich. variabilis*), so that the top itself is a cylinder of ectoderm, mesogloea and entoderm, or the invagination takes place at the extreme colony-top, so that the last cross-sections always contain the axis and its layers (*Aphan. indistincta*). Through the invagination and the following growth a broad knob of ectoderm originates, surrounded by mesogloea and entoderm, connected with the bodywall through a narrow septum of mesogloea and entoderm. At a greater distance from the top a colourless horny matter is found, forming an intricate mass with the invaginated ectoderm. Still further from the top this ectoderm arranges itself into a high cylindrical epithelium, at first irregular in thickness, but furtheron from the top regular in thickness, while the axis gets its normal shape and yellow colour; the wall is thin, the lumen is wide; *Aphan. indistincta* shows a divergation of this type of axis, in the top-part of the branches, more like *Dendrobrachia fallax*. — At first the connecting septum changes into a broad fusion of bodywall and axial sheath, but furtheron it grows narrower. — At last the axial ectoderm lessens in thickness and becomes the usual thin layer.

Actinopharynx. In its middle part the actinopharynx has a sagittally elongated slit-like lumen, which is more rounded in the upper part of the actinopharynx and which widens very perceptibly in its lower part, while the actinopharyngeal wall is curved towards the bodywall. One of the species has a sagittally elongated lumen in one polyp and a transversally elongated one in the other polyp. — The free border of the tube descends to a lower level along the primary sagittal mesenteries, but the greatest width is found along the primary transversal mesenteries. — In the slit-like part the sagittal ends form a sort of sulcus, but without a special anatomical structure. — The free border of the actinopharynx may curve upwards and outwards, but in other species it follows the axial sheath; sometimes the wall is almost in contact with the bodywall, along the entire length of the tube. These differences are dependent on the shape of the oral cone. — The entire wall of the actinopharynx may be longitudinally folded (apart from the ectodermal folds). In *Aphan. indistincta* these folds are curved and fused together, so as to make a narrower tube at the distal transversal side. This tube also contains ectodermal folds. — The ectoderm is longitudinally folded, usually without connection with the places of attachment of the mesenteries. The number of these folds may increase very much in the lower part of the actinopharynx; in some cases these folds are absent in the lower part, while they are numerous in the upper part, with the young polyps only. — The ectoderm stains very deeply, which in the first place is caused by the numerous small actinopharyngeal glandcells, near the surface of the ectoderm and by deeply staining glandcells, which are connected with the base of the epithelium by a thin stalk, which may be swollen in its lower part. Sometimes a larger type of deeply staining glandcells is found in the neighbourhood of the mouth (some *Euantipathes*- and *Aphanipathes*-species), while also large alveolar glandcells may occur in the epithelial base. — A dark pigment is found, especially in the lower half of the actinopharynx, in *Stichopathes*- and *Eucirripathes*-species. This pigment increases in

quantity on a lower level, so that the free actinopharyngeal border is sometimes almost black. — On a higher level the pigment diminishes in quantity; it may be found on the highest level along the places of attachment of the primary transversal mesenteries. This pigment lies in longitudinal rows in the epithelial cells. — Usually the musclefibres are absent, but in some cases I saw indications of an ectodermal musclesystem of longitudinal fibres.

In some species the actinopharyngeal ectoderm curves outwards at the mouth so as to form a lip of the same structure; this lip may have its greatest breadth on its distal side. — The mesogloea is very thin; it may form high lamellae, which make the ectodermal folds project far into the actinopharyngeal lumen, especially in its lower parts. Usually the mesogloea is thicker at the places, where the mesenteries join. The mesogloea may contain oval cells and fibres but very rarely. — The entoderm contains very few glandcells; a musclesystem of circular fibres may be developed but without a special sphincter. — The actinopharynx is entirely absent in *Sibopathes gephura.*

Mesenteries. The normal number of ten mesenteries shows deviations in the sub-genus *Eucirripathes.* While most of the *Eucirripathes*-species have ten mesenteries, I find an extra pair of secondary mesenteries in *Eucirr. contorta.* This extra pair is not found, as in Schultze's Dodekamerota, between the anterior secondary mesenteries and the primary transversal pair, but between these secondaries and the anterior primary sagittal pair. This sixth pair is not found in the highest part of the coral cone, which here shows in cross-section the normal aspect of all the other species. — The course of the other mesenteries is very regular; usually they are flat and straight, except the primary transversal mesenteries, which may be convoluted and sinuous. The primary mesenteries descend deepest; the polypar border is reached by the primary transversal pair only. Usually the secondary mesenteries descend much less deeply. — Often I saw the secondary mesenteries descend deepest at the side of the bodywall, and leave the actinopharynx at a higher level, in contrast with earlier observations. In *Eucirr. contorta* the sixth pair of secondaries does not even reach the actinopharynx at all! In *Schizopathes affinis* none of the mesenteries (also none of the primary ones) does reach the actinopharynx! — On the contrary I saw the secondary mesenteries descend deepest on the actinopharyngeal side in several species, somewhat less in number, but the fact is certain; in these cases the mesogloea of the mesenteries was thicker on the side of the actinopharynx, while in the other cases this layer was thickest on the side of the bodywall. There are also species where both ways of joining are found in the same polyp. — The description, following beneath, of the course of the secondary mesenteries in their lower half, is also an argument for the deeper attachment on the actinopharyngeal side, but in the main I should say that the secondary mesenteries descend deepest on the side of the bodywall. — One species shows fusions between some of the mesenteries and folds of the actinopharynx; even one of the secondary mesenteries is found between two such folds in the higher part of the oral cone, and it is entirely absent in the highest part; some other species show the same fact for the lower part of these mesenteries, which may even fuse with the primary transversal mesenteries.

The mesogloea of the mesenteries is homogeneous but in one species it contains *stellate* connective tissue cells.

The musclesystem is clearly visible in several species; usually there are unilateral longitudinal musclefibres, supported by mesogloeal lamellae, sometimes with secondary lamellae. The system of transversal musclefibres is not so well developed and its mesogloeal lamellae are much shorter. In fig. 262 I have put together the different systems of mesenterial musclefibres, as they were found in the examined species. — Ed. van Beneden calls that part of the polyp, where the sixth pair of secondary mesenteries appears, the anterior part. So this anterior part is without further difficulty indicated in *Eucirr. contorta* (*I*); the longitudinal musclefibres are then placed on the posterior side of the primary transversal mesenteries. Suppose all the Antipatharia, which have these musclefibres, possess the longitudinal musclefibres on the same side of these mesenteries, *II* to *X* of fig. 262 give the musclesystems of the other species in such a manner

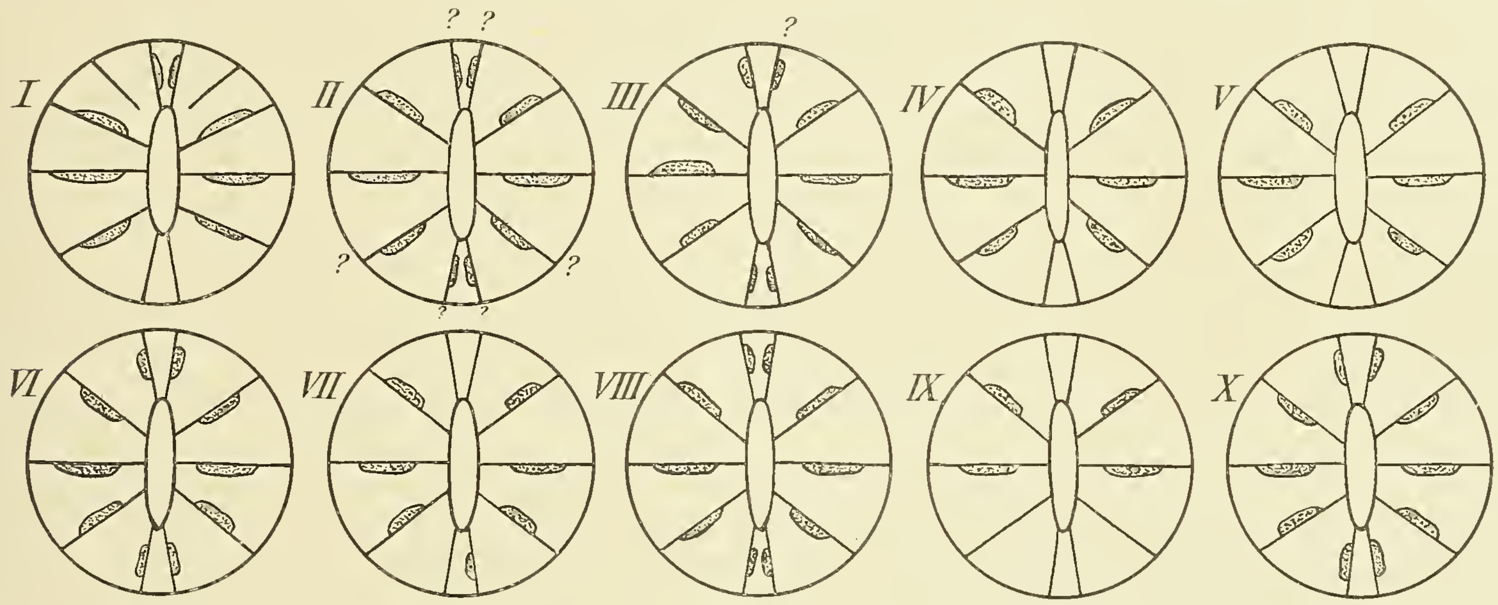

Fig. 262. Schemata of the systems of longitudinal musclefibres on the mesenteries of various species.

I *Eucirripathes contorta* v. Pesch.
II *Eucirripathes anguina* v. Pesch.
III *Eucirripathes musculosa* v. Pesch.
IV *Stichopathes variabilis* n. n.
V *Stichopathes solorensis* sp. n.
VI *Stichopathes gracilis* (Gray) em.
VII *Stichopathes saccula* sp. n.
VIII *Stichopathes ceylonensis* T. & S.
IX *Euantipathes plana* (F. C.).
X *Euantipathes longibrachiata* n. n.

that they may be compared with *Eucirr. contorta*. It appears that these systems may be arranged into groups. One of these groups is represented best by *Stich. ceylonensis* (*VIII*). To this group also appertain *Eucirrip. contorta* (*I*), *Eucirr. anguina* (*II*), *Stich. variabilis* (*IV*), *Stich. solorensis* (*V*) and *Euant. plana* (*IX*). That is to say that the mesenterial musclefibres of these species are also present in *Stich. ceylonensis*, but not that all of them have a complete system. *Euant. plana* (*IX*) is the less developed, for there are only mesogloeal lamellae on the primary transversal mesenteries and the anterior secondary mesenteries, but without musclefibres! In *IV* and *V* the primary transversal mesenteries and both pairs of secondary ones bear musclefibres, but not the sagittal mesenteries. *I* has musclefibres besides on the anterior sagittal mesenteries, while *II* as well as *VIII* have a complete musclesystem on all the mesenteries, which system is not everywhere visible with absolute certainty in *II*. This system is: the longitudinal musclefibres are found on the anterior side of the anterior sagittal pair and of the anterior secondary pair, but on the posterior side of the other three pairs of mesenteries.

The second group contains *Stich. gracilis* (*VI*) and *Euant. longibrachiata* (*X*), both with a complete system on all the mesenteries. This system is as follows: the longitudinal musclefibres are found on the anterior side of the posterior pair of secondary mesenteries and of the posterior sagittal pair, but on the posterior side of the other three pairs of mesenteries.

It is to be remarked that by changing the position of the longitudinal musclefibres of the first group towards the opposite side of the mesenteries and by inverting the entire figure, we get the system of the second group. The supposition would be apert that I have taken in *VI* and *X* the transversal musclefibres for the longitudinal ones, but, although locally such an error is not impossible through the peculiar course of the mesenteries and the musclefibres, this is without any doubt not the case here. The system could be made out without any difficulty with these species in the series of sections, since it is very clear and regular in all the examined polyps. Besides in such a case I ought to have found the longitudinal fibres also, which are always better developed than the transversal fibres; but I saw no other system besides the one described. From the remaining systems (*III* and *VII*) *Eucirr. musculosa*, with great probability, may be joined to the first group of *Stich. ceylonensis* a. o.; the arguments for this opinion are given, in a more explicit manner, in the anatomical description of *Eucirr. musculosa* (cf. p. 199). — At last the system of *Stich. saccula* (*VII*); this system deviates from the first group in the position of the longitudinal musclefibres on the posterior pair of secondary mesenteries. This system may be reckoned as a variant of the first group, so demonstrating the plasticity of the Antipatharia, even on this head. — While some species (*Aphan. Sibogae*, *Aphan. indistincta* a. o.) have mesogloeal lamellae, with (*Euant. dichotoma*) or without musclefibres, on their primary transversal mesenteries only, an other species (*Euant. ericoides*) shows these lamellae, without fibres, on the same mesenteries, but on the anterior side of the anterior pair of secondaries besides, so following the system of the first group. — The probability is very great that we may take the longitudinal musclesystem on the mesenteries of the first group as typical for the Antipatharia (cf. fig. 262, *VIII*, and the description on p. 241).

This system may be substituted by the second system with reversed position of the musclefibres on all the mesenteries. Small deviations may occur. However there are several species without any trace of a mesenterial musclesystem. The longitudinal musclefibres are best developed in the primary transversal mesenteries; they are followed in strength by the secondary mesenteries, which are subequal, compared with each other. These fibres are very slight in the primary sagittal mesenteries, where I could see them clearly only very seldom. The sixth pair of secondary mesenteries did not contain musclefibres.

The mesogloeal lamellae, which support the fibres, may be fused basally into small groups. — One species only had a unilateral swelling of the primary sagittal mesenteries, but without lamellae or musclefibres. — In the lower part of the mesenteries (especially the primary transversal ones) the longitudinal musclefibres and the transversal ones on the opposite side of the mesentery, are almost parallel with each other, and with the free border of the mesentery.

The anterior and posterior half of the polyp may be different in dimensions (*Euant. ericoides* and *Eucirr. contorta*). The anterior side is the most developed. — The entoderm of the mesenteries rarely contains deeply staining glandcells.

The position of the mesenteries, as well as their musclesystem and the development of the sexual cells, are more in accordance with Broök's opinion about the position of the axes of the polyp than Schultze's opinion. Especially in *Eucirr. contorta* and *Euant. ericoides* it is very clear that the corporal axis, which is at right angles with the longitudinal axis of the colony, divides the polyp in symmetrical halves, which is not the case for the corporal axis, which coincides with this colony-axis. The musclesystem is arranged symmetrically in regard to the longitudinal axis of the actinopharynx. The very unequal development of the primary transversal mesenteries and the neighbouring secondary mesenteries, which is always striking in every species, as well as the absence of these secondary mesenteries in the Homoeotaeniales are a great obstacle for Schultze's opinion about the coincidence of the sagittal axis with the short axis of the actinopharynx (the colony-axis). According to Schultze the mesenteries in question would be the directive mesenteries.

Mesenterial filaments. They are to be found not only along the primary transversal mesenteries, as is mentioned by other authors, but also (in several species) along the primary sagittal mesenteries and even along the secondary mesenteries (i. a. *Eucirr. contorta* and *Stichop. variabilis*). However they attain their maximum development along the transversal mesenteries, where they are straight along the upper part of the mesentery, but convoluted and even branched to a rather high degree, along the lower part; along the other mesenteries they are always straight and unbranched. — Their shape, in cross-section, is round, oval or kidney-shaped; when they are much broader than the mesentery there is often a constriction of the mesentery at the base of the filament, but the mesentery may also broaden gradually into the breadth of the filament. — Their structure is clearly the same as of the actinopharyngeal ectoderm; they stain as deeply, the same glandcells are present and the pigmentation is often very striking. They may be pigmentated when the rest of the polyp is free from pigment. They are single-lobed, with an large crowding of pigment at the limit between the ectoderm and the mesenterial entoderm. Sometimes the entoderm surrounds the filament cup-like (as with *Eucirr. contorta* and *Stichop. solorensis*). With *Aphanip. indistincta* the ectoderm is found on the entodermal side of the mesogloeal fork in the filament; perhaps this is a beginning of the formation of more lobes. In *Enantip. dichotoma* the actinopharyngeal glandcells are even to be found especially outside the mesogloeal fork and less between it. The fork-angle may be acute of obtuse. — There are no nematocyst-batteries; only in one species the filament contained single nematocysts.

In one case the mesenterial filaments were not in connection with the actinopharynx-ectoderm as is normal with other species, but they were separated from the free border of the actinopharynx by a narrow part where the ectodermal cap was lacking.

When the filaments are not continued to the end of the mesentery, the peripherical part of the free border may show an entodermal and mesogloeal swelling, without pigment or glandcells, but with many oval cells in the mesogloea.

Sexual cells. The polyps are unisexual; the colonies are of different sex. The largest number of species have their sexual cells in the primary transversal mesenteries, but in one species *(Eucirr. contorta)* there are very well developed ovaria to be found in the anterior pair of secondary mesenteries, and even in the sixth pair of secondary mesenteries. Perhaps there are ova to be found in the anterior sagittal mesenteries but this is very uncertain and highly improbable. However the ovaria are always best developed in the primary transversal mesenteries. The mesogloea of the ovaria-bearing mesentery is dissolved in fine fibres in the fertile part of the mesentery, surrounding the ova (but not the ovaria) with a very thin mesogloeal capsule, which is much thicker for the testes-follicles. The ova may have a thicker capsule, but rarely, as in *Sibopathes gephura*. The collapsed state of some capsules indicates the liberation of the ova by the bursting of the capsule. The youngest ova are found in the neighbourhood of the mesenterial mesogloea, near the ovarial limits. The ovaria are developed unilaterally, which may especially be noted in the secondary mesenteries.

The thick mesogloeal capsule of the testes-follicles is in connection with the mesenterial mesogloea. This capsule is thinner as it is nearer the epithelial surface of the mesentery; in this case the connection with the mesogloea of the mesentery is not always well visible and the ripe testes are surrounded especially by epithelium. The spermatozoa may be liberated into the gastral cavity by the bursting of the capsules, but in other cases I saw the spermatozoa pass through the invagination-opening of the mesenterial mesogloea, which gave origin to the capsule: this opening was probably the primitive one but may perhaps also be a secondary one. — In one case I saw free testes-capsules in the gastral cavity near the mouth. — The tails of the spermatozoa are arranged in a cylinder or fan-shaped; this bundle may be composed of secondary bundles. With some species I saw the tails all of them directed towards the mesenterial mesogloea.

As to the mode of origin of ovaria and testes, it is to be remarked that the sexual cells are of entodermal origin; they are found in the entoderm on the same side of the mesenteries as the longitudinal musclefibres. The mesogloea below these cells invaginates into a capsule, which in this manner is after all found on the same side of the mesentery as the transversal musclefibres, where they remain definitively. The capsules may remain connected with the mesenterial mesogloea as is very often the case with testes as well as for ova. In the case of testes I have seen this stalk of the capsule remain open (or being secondarily opened) for the passage of the ripe spermatozoa; in the case of ova I have seen the opening of the invagination but rarely. — The unilateral swelling of the mesenteries and the S-shaped folding, in which the swelling results, I have discussed more extensively on p. 227 and figured in fig. 261. — When the unilateral development is not immediately visible, it may be deduced from secondary facts, such as the occurrence of ova in the base of only one lateral tentacle of the same pair, etc. — As a remarkable deviation I found testes in the entoderm of the bodywall, near the place of attachment of the primary transversal mesenteries, and even in the ectoderm of the tentacles, probably while the mesogloeal invagination transferred the testes from the entoderm towards the ectoderm (cf. *Stichopathes variabilis*, p. 233); in the bodywall the mesogloea was too thick to invaginate, but the mesogloea at the tentacle-top is much less resistent.

There is no connection between the cushion-shape of some polyps and their possible fertility, as is supposed by some authors; I saw polyps with a very large but entirely empty gastral cavity, without a trace of ova or testes.

In view of the lack of ontogenetic data I examined every polyp closely for eventual states of development of eggs or larvae, but I nowhere found a trace of them.

Growth of the colony. Besides the apical growth of the colony and the interpolypar growth I find in *Eucirripathes contorta* a forming of young polyps on the peristome of an adult polyp. Here the mouth originates before the tentacles; one of the young polyps lacks every tentacle, but has an actinopharynx with a complete set of mesenteries except the sixth pair. Only one of the young polyps has sagittal tentacles. The free borders of the actinopharynges of the young polyps are connected with that of the adult polyp. These young polyps have already well developed ovaria. — Probably the same mode of growth explains the existence of small tentacles on the oral cone, as is described by me on p. 130. — Apparently this peristomal growth is rather rare.

As to the development of the polyps in the normal manner, I found in one case that the lateral tentacles also appear rather late, in any case after the sagittal tentacles and after the appearance of oral cone and mouth. — The secondary mesenteries were absent, so that they are formed later than the other three pairs, which were already present.

Parasites. With several species I find symbiotic Algae (diameter 7—10 μ) in the entoderm of the tentacles, the actinopharynx, the bodywall, etc., even of the mesenteries. The ectoderm of tentacles, oral cone and bodywall contains smaller ones (diameter 3 μ). In one species they are colourless, with a diameter of 5—7 μ. — Several species contain a unicellular parasite in the ectoderm (as with *Eucirr. contorta*), or in the entoderm of the tentacles with some species. One species has much larger unicellular organisms, free in its gastral cavity. In one case a Plathelminth was observed in the gastral cavity.

Dimensions of the layers. Usually the tentacles have the thickest layers, and here the ectoderm is the best developed of the three. The mesogloea usually diminishes in thickness from the tentacle-base towards the top, where the mesogloea is sometimes all but absent. The layers of the oral cone are of the same thickness as in the tentacles or only a little less. The other part of the bodywall usually is much thinner, sometimes to a high degree, i. e. *Eucirr. translucens* where the tentacular layers are resp. 105 μ, 140 μ and 150 μ, against 40 μ, 14 μ and 18 μ in the bodywall. — The mesogloea may attain an enormous thickness in the entire polyp, as is demonstrated by *Eucirr. anguina*, but especially by *Stichop. gracilis* and *Eucirr. translucens*.

The actinopharyngeal ectoderm usually is thick (of the same order as the tentacles) while the mesogloea is very thin and the entoderm is like that of the bodywall. Sometimes the mesogloea is exceptionally thick (*Stichop. semiglabra*). — The mesenteries usually have a very thin mesogloea, and an entoderm like the bodywall.

The ova are from 65 to 400 μ, so rather large; the testes-follicles are about 100 μ in diameter.

The axis-wall is much thinner than the radius of the lumen; it should be kept in view

that the sections are made through the young top-parts of the colonies. However the inverted ratio may also occur (*Euantip. plana*). The axial epithelia are very thin as to the ectoderm (3—12 μ) except at the base of the spines, and as to the mesogloea (less than 1 to 7 μ). The mesogloea is rarely thick, as in *Schizop. affinis*. The entoderm usually is thin, but in rare cases may attain a rather great thickness, up to 40 μ.

GENERIC DIFFERENCES.

Generally these differences are not very great, while often the differences in microscopical anatomical structure within the same genus are as large or even larger than between two genera. Even within one and the same species the anatomy may vary exceedingly. — The most striking is the absence of an actinopharynx in the genus *Sibopathes*, which fact is accompanied by a greater development of deeply staining glandcells in the entire entoderm of the oral cone, but also of the bodywall, and even of the axial sheath, by the absence of mesenterial filaments, and by the very slight development of the mesenteries. — For the rest there may be given, properly speaking, no generic differences, except at the utmost that generally the development of the musclefibres is great in both sub-genera of the genus *Cirripathes* and that in this same genus the pigmentation of the actinopharyngeal ectoderm and of the mesenterial filaments may be very copious. But even this can not be given as a rule, as is very apparent by comparing in this respect the various colonies of *Stichop. variabilis*.

PHYLOGENETIC REMARKS.

The first author to publish phylogenetic remarks about the Antipatharia was G. von Koch [1]), who deduced the Antipatharia from Actinia-like organisms, via *Gephyra Dohrnii*, described by him, and which appeared to be a *Sagartia*-species. According to von Koch the polyps are very much like several small Actinia in microscopical anatomical structure, but with a very reduced musclesystem; this reduction is explained by him as a result of the reduction of the size of the polyps and the forming of colonies. For the same reason the number of the tentacles is reduced, as is found in almost every coral-colony. The reduced condition of the mesenterial filaments along most of the mesenteries, except the transversal ones, instigates von Koch's opinion that the ancestral forms of the Antipatharia had six mesenterial filaments and so six antimeres also.

Haacke [2]) is of the same opinion as von Koch; the Antipatharia remain in a state, which is intermediate between the Edwardsia- and the Halcampula-stadium.

Brook (1) is of opinion that the Antipathinae approach nearer to the Cerianthidae than to the Hexactiniae, on ground of his microscopical anatomical data. He pays attention especially to the place of the mesenteries, the thin mesogloea without star-shaped connective tissue cells, the ectodermal layer of musclefibres in the actinopharynx and in the bodywall, and the rudimentary condition of the mesenterial musclefibres. Notwithstanding the latter character Brook makes an attempt to compare the mesenteries of the Antipatharia with those of the other Zoantharia. He comes to the conclusion that *Leiopathes* (= pars *Antipathes*), with its six pairs of mesenteries, is the original type of the Antipatharia, from which the other genera with five or even three pairs of mesenteries are to be deduced through reduction. *Leiopathes* with its twelve mesenteries is compared by Brook to the Halcampula-stage of the Hexactiniae.

Opposite the opinion of von Koch, Haacke and Brook, who advocate the hypothesis that the Antipatharia are reduced forms, may be placed the opinion of Ed. van Beneden, Goette, Roule a. o., who regard the Antipatharia as primitive, not reduced organisms. Van Beneden (7) in the first place contradicts Brook's opinion that *Leiopathes* should be regarded as the perfect ancestral form of the Antipatharia; the mesenteries of *Leiopathes* are not to be homologized with those of the Halcampula-stage. Besides the place of the tentacles,

1) Mitteilungen über Coelenteraten; Zur Phylogenie der Antipatharia (Morphol. Jahrb. Bd. IV, Suppl. p. 74—86).
2) Zur Blastologie der Korallen (Jenaische Zeitschrift, Bd. XIII, p. 269—320).

an other obstacle is that the pair of mesenteries, which is formed first with the Hexactiniae and which dominates the following development, would be represented by the second pair of anterior secondary mesenteries of *Leiopathes* and so would be absent in all the other Antipatharia. Van Beneden can not see any regression in the secondary mesenteries, since the Edwardsiae demonstrate that, with Hexactiniae, the tentacles disappear after the interseptal chambers. None of the Antipatharia has more than six tentacles, and so the secondary mesenteries are new ones. Besides van Beneden is of opinion that Brook would have found it extremely difficult to prove that, with the so very divergent genera of the Antipatharia, the regression of the mesenteries should be advanced everywhere to the same stage, except for *Leiopathes* and *Cladopathes*.

The opinion about the primitive state of the Antipatharia should be kept separate from van Beneden's thesis that the Antipatharia ought to be combined with the Ceriantharia to the Ceriantipatharia, in contrast with the remaining Hexactiniae. — The following characters of the Antipatharia are put together by him as of general value: six primary mesenteries, two of which are transversally directed and fertile, and four of which are directives; six tentacles which are situated above the primary interseptal chambers: two median and four lateral, the latter of which are equal two and two; bilateral symmetrical polyp; sulcus and hyposulcus; ectodermal longitudinal musclefibres in the bodywall. According to van Beneden these characters are very like those of the *Arachnactis*-larva, which he named Cerinula; for this reason he regards the Antipatharia as sexual forms, which morphologically appertain to the larval stage of Cerianthus. The Cerianthidae have originated from ancestral forms, which are like the present Antipatharia and which now are represented by the larva *Cerinula* and by the genus *Cladopathes*. The Antipatharia have become inclined towards an increasing number of mesenteries through a partition of the lateral interseptal chambers, while with the Ceriantharia the new mesenteries take origin in the posterior median interseptal chamber of the larva. Against this opinion may be said that the transversal primary mesenteries are not the only ones which may be fertile; besides the lateral tentacles are in most cases not equal two and two in the sense of van Beneden, for usually the distal pair of lateral tentacles is smaller than the proximal lateral pair, so that the polyp is not exactly bilaterally symmetrical. The difference in length between the anterior and posterior pair of lateral tentacles, as van Beneden has found it in young polyps, I have seen nowhere, neither in young polyps, nor in adult ones. Also the existence of a true sulcus and hyposulcus I am very much inclined to doubt. At last: the situation of the longitudinal musclefibres on the mesenteries is very different from those of the Ceriantharia, while the succession in the origin of the mesenteries in Antipatharia can only be supposed by van Beneden theoretically since all ontogenetic data are entirely lacking.

Goette (8) is of the same opinion as van Beneden; he sees the Antipatharia as primitive forms, and he combines them with the Ceriantharia; both are deduced from a Scyphopolyp with six mesenteries. Goette deviates from van Beneden in questions of descendency, which have nothing to do with the relationship between the Antipatharia and the Ceriantharia.

Delage and Hérouard [1]) neither believe the twelve mesenteries of Leiopathes to be a

1) Traité de Zoölogie concrète. Tome II.

primitive character, which is to be compared with the mesenterial character of the normal Actinia, especially in view of their relative position. But they are neither of the opinion of VAN BENEDEN that the Antipatharia ought to be combined with the Ceriantharia. If the latter are separated from the remaining Actinia in view of their zone of growth, one must be consequent and separate them also from the Antipatharia, which in this respect are different from them.

We find extensive discussions of these questions in ROULE (13 and 14). In 13 ROULE gives a review of former opinions, and joins VAN BENEDEN's opinion. In this respect ROULE refers to his examination of *Stichopathes*-species, the bodywall of which, with its thick mesogloea is precisely like that of young *Cerianthus*-larvae, before the ectodermal musclefibres appear. He emphasizes the primitive character of the Antipatharia, which through their faculty of budding and the forming of fixed colonies have not disappeared as their ancestral types, and which are only higher developed in the shape of the colonies, while the individual polyps have preserved their ancient character. ROULE places the Rugosa, Antipatharia and Ceriantharia together as Protanthozoariae opposite the other Anthozoa, which form the Metanthozoariae. As to the thickness of the mesogloea with *Stichopathes*-species, the value, which ROULE gives to it, is discussed by me and rejected in the review of the anatomical results.

ROULE gives more arguments in 1905 (14) in his more extensive publication. In the first place he advocates the relation between the Antipatharia and the Ceriantharia, opposite DELAGE and HÉROUARD. According to ROULE the likeness was not sought in the zones of growth but in the characters of the primary mesenteries, for, as to these mesenteries and their interseptal chambers, the situation is the same as in *Cerinula*, so that there is an undoubted homology between these situations, lasting in the one, transitory in the other. ROULE also sees a microscopical anatomical relation with the Ceriantharia; but it is to be regretted for his arguments that his own research on this point is not very convincing since his material is scanty and badly preserved, so that his conclusions are not always permitted. ROULE points out that the Antipatharia and the Ceriantharia have in common: a homogeneous, thick mesogloea, no mesenterial musclefibres, a simple, not differentiated entoderm, all points in contrast with the other Anthozoariae. I have to add to this, that it is true that formerly the zones of growth were not used as an argument for combining the Antipatharia and the Ceriantharia, but that this fact makes it not less true that these zones are an obstacle for that union, when they are also used to keep other groups apart. — The homology of the mesenteries with those of *Cerinula* cannot be very great when we keep in view that other mesenteries may be fertile beside the transversal mesenteries, and also the entirely different arrangement of the musclefibres and the existence of mesenterial filaments on other mesenteries at the side of the transversal ones. All this indicates that there is an accidental likeness between both conditions of the mesenteries, without a more fundamental connection, no more than that the twelve mesenteries of *Leiopathes* could be compared with those of the *Halcampula*-stage. — As to the microscopical anatomical arguments, I have only to refer to the several Antipatharia with well developed musclefibres on their mesenteries, longitudinal fibres as well as transversal ones, and to the several cases, where cells were found in the mesogloea, oval ones or even stellate cells. — Even so the abundant pigmentation of the actinopharyngeal

ectoderm and the mesenterial filaments, as is found in several Antipatharia, is entirely absent in the Ceriantharia.

ROULE places the Antipatharia at the base of the Anthozoariae, i. a. while they are not truly bilaterally symmetrical organisms, viz. where "l'organisme produit ses parties principales, et les oriente d'emblée, symétriquement par rapport à un plan médian; il les conserve ainsi" (ROULE: 14, p. 45), but binarily symmetrical, which is a sort of bilateral regulation of an organism, which at first was radial. The structure of the Antipatharia is radial, but they become binarily symmetrical through the flattening of the actinopharynx, which, in its turn, causes a disproportion between the median and the lateral tentacles and interseptal chambers. The flattening of the actinopharynx is caused by the colonial mode of living; the polyps stretch out at right angles with the colony-axis, to be no hindrance to each other. Although I agree with ROULE that the Antipatharia are not reduced organisms, I have some objections to the latter arguments. The polyps of the Antipatharia are elongated in the direction of the colony-axis, sometimes to an exceedingly high degree; it is not clear how this fact is to be combined with an elongation of the polyps in a sagittal direction, to give no hindrance. Besides the Cerianthus-larvae are binarily symmetrical, in ROULE's sense, and scarcely the adult Ceriantharia are bilaterally symmetrical. With these Cerianthus-larvae there is no question about colony-formation; in what manner is the binaril symmetricy to be explained in this case? — If, on the other hand, ROULE will call the Cerianthus-larvae truly bilateral, I see in this fact a new difference with the binarily symmetrical Antipatharia, so that the relation between the Antipatharia and the Ceriantharia is lessened, opposite to ROULE's opinion.

For the rest, ROULE remarks that the Antipatharia may be called primitive, while the oecology as well as the bathymetrical and the zoogeographical distribution indicate a great age of the Antipatharia.

While the differences between the Antipatharia and the Ceriantharia are too great to permit the combining of them to Cerianthipatharia, there is much to say in favour of the thesis that the Antipatharia are primitive organisms. As one of the most important arguments in favour of the opinion that the Antipatharia are reduced organisms is given, that the secondary mesenteries descend deepest on the side of the actinopharynx. The mesenteries of the Anthozoariae take origin at the side of the bodywall and reach the actinopharynx later on, so that they are shorter at the side of the actinopharynx. But with the Antipatharia I find that the secondary mesenteries in most cases descend deepest at the side of the bodywall, while the sixth pair of *Eucirripathes contorta* as well as all the mesenteries in *Schizopathes affinis* are fixed at the side of the bodywall, while they do not reach the actinopharynx at all. This facts are more in accordance with a new appearance of mesenteries than with a reduction of existent mesenteries. Besides the sixth pair of mesenteries is the only one which can not bear muscle-fibres and so is probably of younger origin; the few facts which could be obtained as to the succession in development of the mesenteries, indicate that the secondary mesenteries appear after the primary ones and that the sixth pair is developed at a later stage of development of the young polyps than the other mesenteries.

Among the Antipatharia themselves Roule regards the unbranched colonies as the primitive genera and the branched colonies as the phylogenetically younger ones. On this point I am not of Roule's opinion. I am rather inclined to regard the unbranched colonies as the higher developed organisms, and the lack of branching as a secondarily acquired simplicity. The occurrence of the sixth pair of secondary mesenteries, but especially the rather well developed mesenterial muscle-system with *Eucirripathes* and *Stichopathes* are a sign of higher development, which is found only in one species of *Euantipathes* and further, in course of formation, with some other species, which have only mesogloeal lamellae or a unilateral swelling of the mesenteries or nothing at all. — Since the formation of high ectodermal folds in the actinopharynx, especially if they are supported by mesogloeal lamellae, which project far into the actinopharyngeal lumen, is in my opinion a sign of higher development (increase of the surface of the actinopharyngeal tube), the species which show this character, viz. *Stichopathes variabilis* and *semiglabra*, support the thesis that the unbranched genera are more highly developed. The same holds good for the fact that mesenterial filaments along the secondary mesenteries are found with the unbranched species only. The abundant pigmentation, which is found especially with unbranched species, as well as the typical peristomal growth of young polyps with *Eucirripathes* (and perhaps with *Stichopathes*) increase the probability of my opinion.

The genus *Sibopathes* is very primitive, since there is no actinopharynx, a great number of large deeply staining glandcells in the entire entoderm in stead of a concentration of them into an actinopharynx, no secondary mesenteries, very short primary mesenteries, no mesenterial filaments, a very thin mesogloea, a very broad connecting septum between the bodywall and the axial sheath, and hardly any musclefibres. Without any doubt this genus represents the lowest developed type of the Antipatharia.

As somewhat higher developed genera I reckon *Schizopathes* and *Eubathypathes*, especially in view of the very slight development of their musclefibres and the lack of a mesenterial muscle-system, the attachment of the secondary mesenteries on the side of the bodywall only, and the very thin mesogloea. Higher developed are *Euantipathes* and *Aphanipathes*, where are found mesogloeal lamellae for mesenterial musclefibres, although these fibres themselves are still absent. Especially the subgenus *Aphanipathes* is more highly developed, since the actinopharynx may show longitudinal folds of the entire wall beside the numerous ectodermal folds. Also some *Euantipathes*-species already show many ectodermal folds in their actinopharynx. *Parantipathes* should be interpolated between *Schizopathes* and *Euantipathes* in point of development.

SYSTEMATIC INDEX[1]).

1) This index is arranged according to the generic as well as to the specific names; the synonyms and the varieties are included in this list.

CORRIGENDA.

On p. 16. Read *Bathypathes patula* = *Eubathyp. patula* for *Bathypathes quadribrachiata* = *Eubath. quadribr.*

On p. 27. Read *Schizopathes* (Br.) emend. for *Schizopathes* Br. (emend.).

On p. 27. Read *Schizopathes affinis* (Br.) emend. for *Schizopathes affinis* Br. (emend.).

On p. 39. Omit n. n. from *Euantipathes abies* (Gray) n. n.
Ditto in figs. 12—14*a*.

On p. 42. Omit n. n. from *Euantipathes myriophylla* (Pall.) n. n.
Ditto in figs. 15—22 and on p. 48.

On p. 48. Omit n. n. from *Euantipathes plana* (F. C.) n. n.
Ditto in figs. 23, 24.

On p. 54 a. f. Read emend. for n. n. in figs. 29—61.

EXPLANATION OF THE PLATES

LIST OF ABBREVIATIONS

concerning all the figures from plates I—VII.

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a. = symbiotic Algae.
act. = actinopharynx.
act. k. = actinopharyngeal glandcells.
a. ec. = axis-ectoderm.
a. en. = axis-entoderm.
a. me. = axis-mesogloea.
c. k. = central lumen of the axis.
d. = spine.
ec. = ectoderm.
en. = entoderm.
g. = gastral cavity.
gr. nem. = large type of nematocysts.
h. k. c. = hyaline glandcells.
i. = axis-intima.
$I. r^1$. = interseptal room between Sp_1 and s_1.
$I. r^2$. = interseptal room between s_1 and Sp_2.
$I. r^3$. = interseptal room between Sp_2 and Sp_2.
$I. r^4$. = interseptal room between Sp_1 and s_2.
$I. r^5$. = interseptal room between s_2 and Sp_3.
$I. r^6$. = interseptal room between Sp_3 and Sp_3.
$i. r^1$. = interseptal room between s_1 and s_3.
$i. r^2$. = interseptal room between Sp_2 and s_3.
I. s. = interzooidal septum.
k. c. = deeply staining glandcells.
L. = lateral tentacle.
l. sp. = longitudinal musclefibres.
l. w. = bodywall.
m. c. = oral cone.
me. = mesogloea.
me. f. = mesogloeal fibrillae.
me. v. = mesogloeal lamellae.
m. f. = mesenterial filaments.
n. = nucleus.
nem. b. = nematocyst-battery.
n. i. = nucleolus.
o. = ovum.
p. = pigment.
par. = parasite.
S. = sagittal tentacle.
s. = spermatozoa.
s_1 = anterior pair of secondary mesenteries.
s_2 = posterior pair of secondary mesenteries.
s_3 = sixth pair of (secondary) mesenteries.
s. k. = axis-wall.
Sp_1. = primary transversal mesenteries.
Sp_2. = anterior primary sagittal mesenteries.
Sp_3. = posterior primary sagittal mesenteries.
sp. l. = layer of musclefibres.
s. s. = tails of spermatozoa.
t. = testis.
tr. sp. = transversal musclefibres.
v. l. = connecting septum of the axis.
z. l. = nervous layer.

PLATE I.

Fig. 1. *Eucirripathes anguina* (Dana). Longitudinal section through the base of a sagittal tentacle; 322 ×.
Fig. 2. *Eucirripathes anguina* (Dana). Transversal section through a tentacle; 322 ×.
Fig. 3. *Eucirripathes anguina* (Dana). Transversal section through the tentacular base; 322 ×.
Fig. 4. *Eucirripathes anguina* (Dana). Section through the bodywall (vertical cross-section through the polyp); 322 ×.
Fig. 5. *Eucirripathes anguina* (Dana). Transversal section through the free border of a primary transversal mesentery (vertical cross-section through the polyp); 322 ×.
Fig. 6. *Eucirripathes anguina* (Dana). Ova; 740 ×.
Fig. 7. *Eucirripathes anguina* (Dana). Primary transversal mesentery with ovaria; transition of the sterile in the fertile part of the mesentery; 322 ×.
Fig. 8. *Eucirripathes anguina* (Dana). Horizontal section through a secondary mesentery with longitudinal musclefibres (s_1 out of Pl. V, fig. 10); 322 ×.
Fig. 9. *Eucirripathes nana* v. Pesch. Longitudinal section through a tentacle; 322 ×.
Fig. 10. *Eucirripathes anguina* (Dana). Transversal section through the free border of a transversal primary mesentery (vertical cross-section through the polyp); 740 ×.
Fig. 11. *Eucirripathes anguina* (Dana). Mesenterial filament; 322 ×.
Fig. 12. *Eucirripathes nana* v. Pesch. Longitudinal section through a tentacular nematocyst-battery; 740 ×.
Fig. 13. *Eucirripathes nana* v. Pesch. Section through the transition of the tentacular base and the bodywall (vertical cross-section through the polyp); 322 ×.
Fig. 14. *Eucirripathes nana* v. Pesch. Mesogloea of the oral cone; 322 ×.
Fig. 15. *Eucirripathes nana* v. Pesch. Transversal section through the bodywall; 322 ×.
Fig. 16. *Eucirripathes nana* v. Pesch. Vertical cross-section through the bodywall; 322 ×.
Fig. 17. *Eucirripathes nana* v. Pesch. Tangential section through a tentacular nematocyst-battery; 740 ×.
Fig. 18. *Eucirripathes nana* v. Pesch. Mesenterial filament; 322 ×.
Fig. 19. *Eucirripathes nana* v. Pesch. Longitudinal section through the actinopharyngeal wall (vertical cross-section through the polyp); 322 ×.
Fig. 20. *Eucirripathes nana* v. Pesch. Vertical cross-section through the axis, connecting-septum and bodywall; 322 ×.


1.
k. c.
ec.
me.
sp. l.
en.
2.
z. l.
ec.
en.
me.
sp. l.
3.
en.
me.
ec.
k. c.
4.
en.
me.
ec.
a.
k. c.
5.
en.
sp. l.
en.
6.
o.
n. i.
n.
I. r¹.
I. r².
en.
sp. l.
en.
7.
en.
me.
o.
en.
en.
me.
8.
en.
me.
ec.
9.
nem. b.
k. c.
nem. b.
10.
me.
en.
en.
11.
m. f.
p.
p.
en.
me.
12.
nem.
k. c.
ec.
13.
me.
ec.
tent.
me. f.
ec.
z. l.
en.
l. w.
14.
me.
en.
en.
en.
15.
en.
me.
z. l.
ec.
16.
k. c.
me.
h. k. c.
nem.
ec.
z. l.
17.
nem.
k. c.
18.
m. f.
19.
ec.
me.
en.
20.
me.
ec.
en.
v. l.
a. en.
s. k.
a. ec.
c. k.
l.

PLATE II.

Fig. 1. *Eucirripathes translucens* v. Pesch. Transversal section through a tentacle; 322 ×.

Fig. 2. *Eucirripathes translucens* v. Pesch. Vertical longitudinal section through the bodywall; 322 ×.

Fig. 3. *Eucirripathes translucens* v. Pesch. Longitudinal section through a sagittal tentacle; part of the entoderm and the entire ectoderm is omitted; 78 ×.

Fig. 4. *Eucirripathes translucens* v. Pesch. Section through the bodywall with place of attachment of a primary transversal mesentery; 78 ×.

Fig. 5. *Eucirripathes translucens* v. Pesch. Horizontal section through the oral cone and the actinopharynx; 322 ×.

Fig. 6. *Eucirripathes translucens* v. Pesch. Mesenterial filament; 322 ×.

Fig. 7. *Eucirripathes contorta* v. Pesch. Horizontal section through the actinopharynx; 322 ×.

Fig. 8. *Eucirripathes contorta* v. Pesch. Mesenterial filament; 322 ×.

Fig. 9. *Eucirripathes translucens* v. Pesch. Transversal section through the mesogloea at the base of the tentacle; 322 ×.

Fig. 10. *Eucirripathes contorta* v. Pesch. Vertical cross-section through the bodywall; 322 ×.

Fig. 11. *Eucirripathes contorta* v. Pesch. The free border, the fertile part, the sterile part and mesenterial filament of a primary transversal mesentery; 322 ×.


1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
nem. b.
k. c.
ec.
me.
en.
sp. l.
z. l.
act. ec.
act. k.
h. k. c.
p.
S. p₁.
m. f.
s₂.
o.
a.

PLATE III.

Fig. 1. *Eucirripathes spiralis* (Blainv.) v. Pesch var. *aphanipathoides*. Horizontal section through the oral cone and the actinopharynx; 322 ×.

Fig. 2. *Hillopathes ramosa* (v. Pesch). Vertical cross-section through the bodywall with interzooidal septum; 322 ×.

Fig. 3. *Eucirripathes contorta* v. Pesch. Longitudinal section through a tentacular base; 322 ×.

Fig. 4. *Eucirripathes musculosa* v. Pesch. Vertical cross-section through the bodywall with the peripherical part of a primary transversal mesentery (part of Pl. V, fig. 9); 322 ×.

Fig. 5. *Eucirripathes spiralis* (Blainv.) v. P. var. *striata*. Oblique section through a tentacle; 322 ×.

Fig. 6. *Eucirripathes musculosa* v. Pesch. Horizontal section through the primary sagittal mesenteries; 322 ×.

Fig. 7. *Eucirripathes musculosa* v. Pesch. Horizontal section through oral cone, actinopharynx and mesenteries; 322 ×.

Fig. 8. *Eucirripathes musculosa* v. Pesch. Mesogloea and musclefibres of the primary transversal mesentery out of Pl. V, fig. 8; the entoderm is omitted; 322 ×.

Fig. 9. *Eucirripathes musculosa* v. Pesch. Longitudinal section through the actinopharyngeal wall, and oral cone; the ectoderm is omitted (vertical cross-section through a polyp); 322 ×.

Fig. 10. *Eucirripathes spiralis* (Blainv.) v. P. var. *striata*. Longitudinal section through the actinopharynx and the oral cone (vertical cross-section through a polyp); 139 ×.

Phototypie L. van Leer & Co., Amsterdam.

PLATE IV.

Fig. 1. *Eucirripathes Rumphii* v. Pesch. Mesenterial filament; 740 ×.
Fig. 2. *Eucirripathes Rumphii* v. Pesch. Ripe testis-follicle; 740 ×.
Fig. 3. *Eucirripathes Rumphii* v. Pesch. Vertical cross-section through the bodywall, connecting septum and axis-epithelium; 322 ×.
Fig. 4. *Eucirripathes Rumphii* v. Pesch. Horizontal section through a primary transversal mesentery with testes; the entoderm is omitted for the greater part; 322 ×.
Fig. 5. *Eucirripathes Rumphii* v. Pesch. Tangential section through nematocyst-batteries out of the tentacular ectoderm; 740 ×.
Fig. 6. *Eucirripathes Rumphii* v. Pesch. Longitudinal section through a nematocyst-battery out of the tentacular ectoderm; 740 ×.

A. J. VAN PESCH. *DEL.*

Phototypie L. van Leer & Co., Amsterdam.

PLATE V.

Fig. 1. *Eucirripathes contorta* v. Pesch. Vertical transversal section through an oral cone with three oral apertures, three actinopharynges, three sets of mesenteries; 1 and 3 are young polyps, 2 is the original polyp. In all three polyps the mouth itself is not attained, but the actinopharynx; 39 ×.

Fig. 2. *Eucirripathes contorta* v. Pesch. Polyps 1 and 2 out of fig. 1, but more towards the polypar limit; the branched mesenterial filament (*m. f.* 3) appertains to polyp 3; 39 ×.

Fig. 3. *Eucirripathes contorta* v. Pesch. Horizontal section through a primary transversal mesentery with unilateral mesogloeal lamellae; 161 ×.

Fig. 4. *Eucirripathes contorta* v. Pesch. Vertical transversal section through a polyp near the polypar periphery; 39 ×.

Fig. 5. *Eucirripathes contorta* v. Pesch. Horizontal section through the upper part of the oral cone, with ten mesenteries; 39 ×.

Fig. 6. *Eucirripathes contorta* v. Pesch. Interzooidal septum (vertical cross-section through a polyp); 39 ×.

Fig. 7. *Eucirripathes contorta* v. Pesch. Somewhat oblique horizontal section through the oral cone and the actinopharynx; the right half is omitted; in the upper part of the figure the cone is attained at a lower level than in the lower part; 39 ×.

Fig. 8. *Eucirripathes musculosa* v. Pesch. Tangential longitudinal section through the oral cone; 39 ×.

Fig. 9. *Eucirripathes musculosa* v. Pesch. Vertical transversal section through oral cone and bodywall; 39 ×.

Figs. 10—14. *Eucirripathes anguina* (Dana). Succeeding vertical transversal sections through a polyp; part of the oral cone, the actinopharynx and the sagittal tentacles; 39 ×.

Fig. 15. *Eucirripathes anguina* (Dana). Horizontal section through the actinopharynx; 39 ×.

Fig. 16. *Eucirripathes anguina* (Dana). Horizontal section through a primary transversal mesentery with ovaria and mesenterial filaments; 39 ×.

Fig. 17. *Eucirripathes nana* v. Pesch. Longitudinal section through actinopharynx and oral cone (vertical cross-section through a polyp); 39 ×.

Fig. 18. *Eucirripathes nana* v. Pesch. Transversal section through the lower part of the actinopharyngeal wall (vertical transversal section through a polyp); 39 ×.

Fig. 19. *Eucirripathes nana* v. Pesch. Vertical transversal section through a polyp with a fusion between the sheath of a spine and a mesentery; 39 ×.

Fig. 20. *Eucirripathes nana* v. Pesch. Vertical transversal section through a polyp, at the limit of the oral cone; 39 ×.

Fig. 21. *Eucirripathes nana* v. Pesch. Vertical transversal section through the bodywall, the connecting septum, the axis-epithelium and a fusion of the sheath of a spine with the bodywall. The entoderm and the ectoderm are only partly figured; 161 ×.

Fig. 22. *Eucirripathes spiralis* (Blainv.) v. P. var. *aphanipathoides*. Oblique section through the oral cone, the actinopharynx and the epithelial sheath of a spine; 39 ×.

Fig. 23. *Eucirripathes anguina* (Dana). Horizontal section through a secondary mesentery with unilateral mesogloeal lamellae; 161 ×.

Fig. 24. *Eucirripathes contorta* v. Pesch. Horizontal section through the mesogloea of four mesenteries in the oral cone; 161 ×.

Fig. 25. *Eucirripathes Rumphii* v. Pesch. Transversal section through a tentacle with the nematocyst-batteries left blank; 69.5 ×.

Fig. 26. *Eucirripathes translucens* v. Pesch. Fusion of the bodywall and the epithelial sheath of a spine; 39 ×.

In all the figures of Pl. V (except fig. 25) the mesogloea is *black*, the entoderm and the ectoderm are *gray*, the actinopharyngeal ectoderm is *gray and hatched*, the pigment is *dotted*.

The arabic numbers of the figures correspond with the roman ciphres on the plate.

A. J. van Pesch del.

PLATE VI.

Fig. 1. *Schizopathes affinis* (Brook). Vertical transversal section through axis and bodywall, with bilateral connecting septa and mesogloeal ridges; 52.2 ×.

Fig. 2. *Stichopathes variabilis* n. n. Schematical longitudinal section through a young spine and its epithelium.

Fig. 3. *Sibopathes gephura* g. n. sp. n. Vertical transversal section through the middle of the oral cone and sagittal tentacles; 214.5 ×.

Fig. 4. *Stichopathes semiglabra* sp. n. Horizontal section through part of the oral cone and actinopharynx, with a mesogloeal lamella; 214.5 ×.

Fig. 5. *Sibopathes gephura* g. n. sp. n. Vertical transversal section through the transversal mesentery in the peripherical third part of the polyp (ectoderm and entoderm are omitted); 383.5 ×.

Fig. 6. *Sibopathes gephura* g. n. sp. n. Vertical transversal section through oral cone, sagittal tentacles and axis-epithelium; 214.5 ×.

Fig. 7. *Stichopathes variabilis* n. n. Vertical transversal section through the oral cone with actinopharynx and lip; 214.5 ×.

Fig. 8. *Stichopathes gracilis* (Gray) emend. The mesogloea of a vertical transversal section through the polyp at the lateral tentacles; 52.2 ×.

Fig. 9. *Sibopathes gephura* g. n. sp. n. Vertical transversal section through the fertile part of the polyp at the base of the lateral tentacles; 214.5 ×.

Fig. 10. *Stichopathes variabilis* sp. n. Vertical transversal section through the colony-top; invagination of the axis-ectoderm; 214.5 ×.

Fig. 11. *Stichopathes solorensis* sp. n. Mesogloea of a vertical transversal section through the polyp at the lateral tentacles. Ovaria; 52.2 ×.

Fig. 12. *Stichopathes gracilis* (Gray) emend. Horizontal section through oral cone, actinopharynx and lateral tentacles. Testes; 52.2 ×.

Fig. 13. *Stichopathes saccula* sp. n. Horizontal section through part of the oral cone and lateral tentacle; secondary septum attached to two folds of the actinopharynx; 52.2 ×.

Fig. 14. *Schizopathes affinis* (Brook) emend. Vertical transversal section through the fertile part of a transversal primary mesentery; 214.5 ×.

Fig. 15. *Sibopathes gephura* g. n. sp. n. Vertical transversal section through a polyp out of the top-part of the colony, with ova in the swollen base of a lateral tentacle. The axis is omitted; usually the axis-mesogloea is thinner; 92.5 ×.

Fig. 16. *Schizopathes affinis* (Brook) emend. Vertical transversal section through the fertile part of a transversal primary mesentery; 214.5 ×.

In all the figures (except fig. 2) the layers are given in the same manner as in Pl. V.


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Sp3.
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Sp2.
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PLATE VII.

Fig. 1. *Stichopathes variabilis* n. n. Vertical transversal section through axis and bodywall at the top of the colony; 322 ×.

Fig. 2. *Stichopathes saccula* sp. n. Horizontal section through the fertile part of a primary transversal mesentery, near the sterile part (to the left); 322 ×.

Fig. 3. *Sibopathes gephura* g. n. sp. n. Section through the bodywall with cells in the mesogloea and the ectodermal base, with mesogloeal canals; 740 ×.

Fig. 4. *Stichopathes variabilis* n. n. Vertical transversal section through part of the bodywall at the place of attachment of a primary transversal mesentery. Testis-follicle in the entoderm of the bodywall; 322 ×.

Fig. 5. *Stichopathes aggregata* sp. n. Vertical transversal section through the polyp at the sagittal tentacles. Axis is omitted; 78 ×.

Fig. 6. *Stichopathes aggregata* sp. n. Vertical transversal section through the polyp at the lateral tentacles. Axis is omitted; 78 ×.

Fig. 7. *Stichopathes aggregata* sp. n. Vertical transversal section through the polyp, near the polypar limit; 78 ×.

Fig. 8. *Stichopathes variabilis* n. n. Vertical transversal section through the top of the colony (at a distance of 150 μ from the top); half-schematical; 322 ×.

Fig. 9. *Stichopathes variabilis* n. n. Transversal section through a tentacle with testis-follicle in the ectoderm; 322 ×.

Fig. 10. *Stichopathes variabilis* n. n. Ditto as fig. 9, but 45 μ further in the series of sections. The testis-follicle connected with the entoderm of the tentacle; 322 ×.

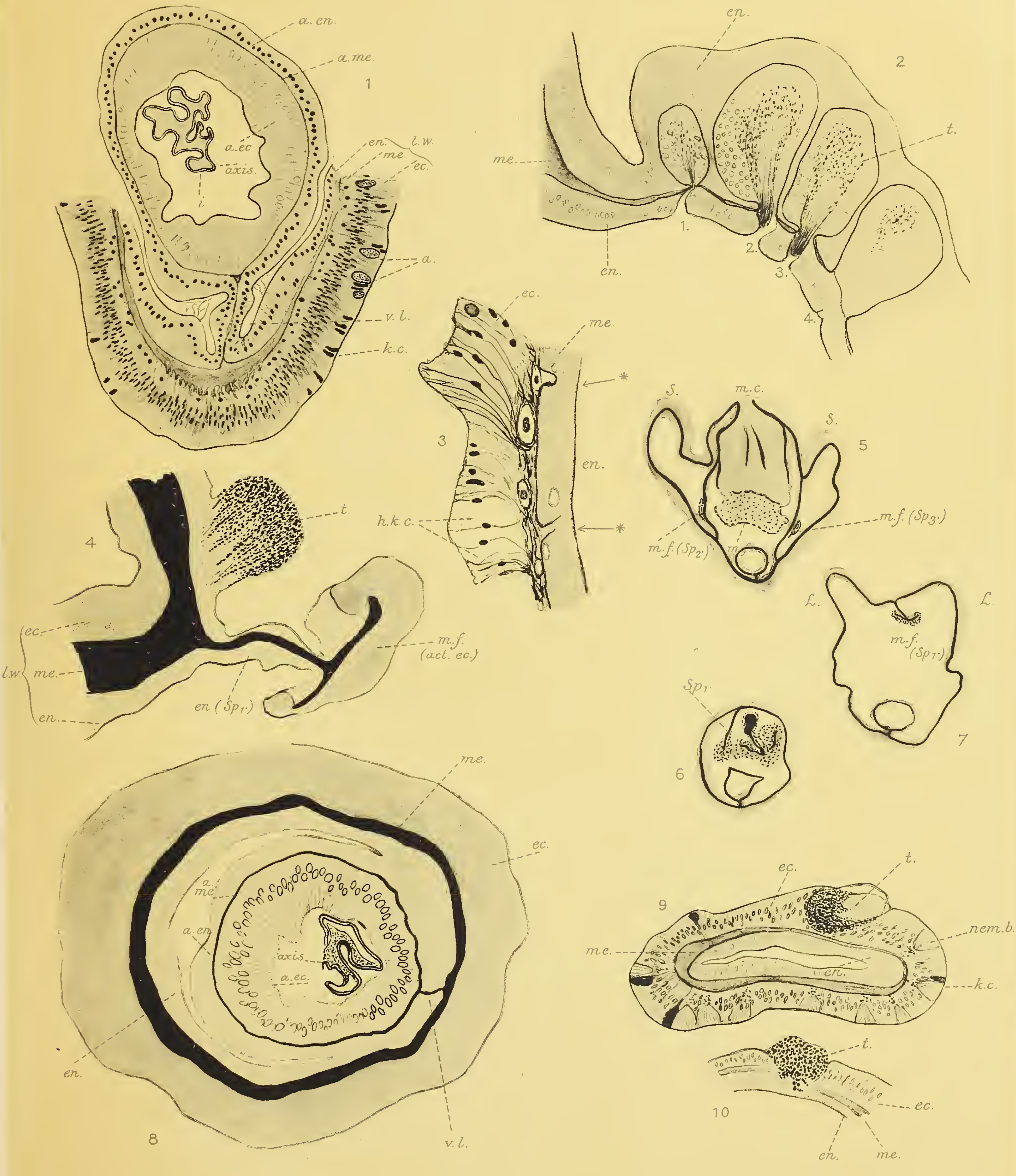
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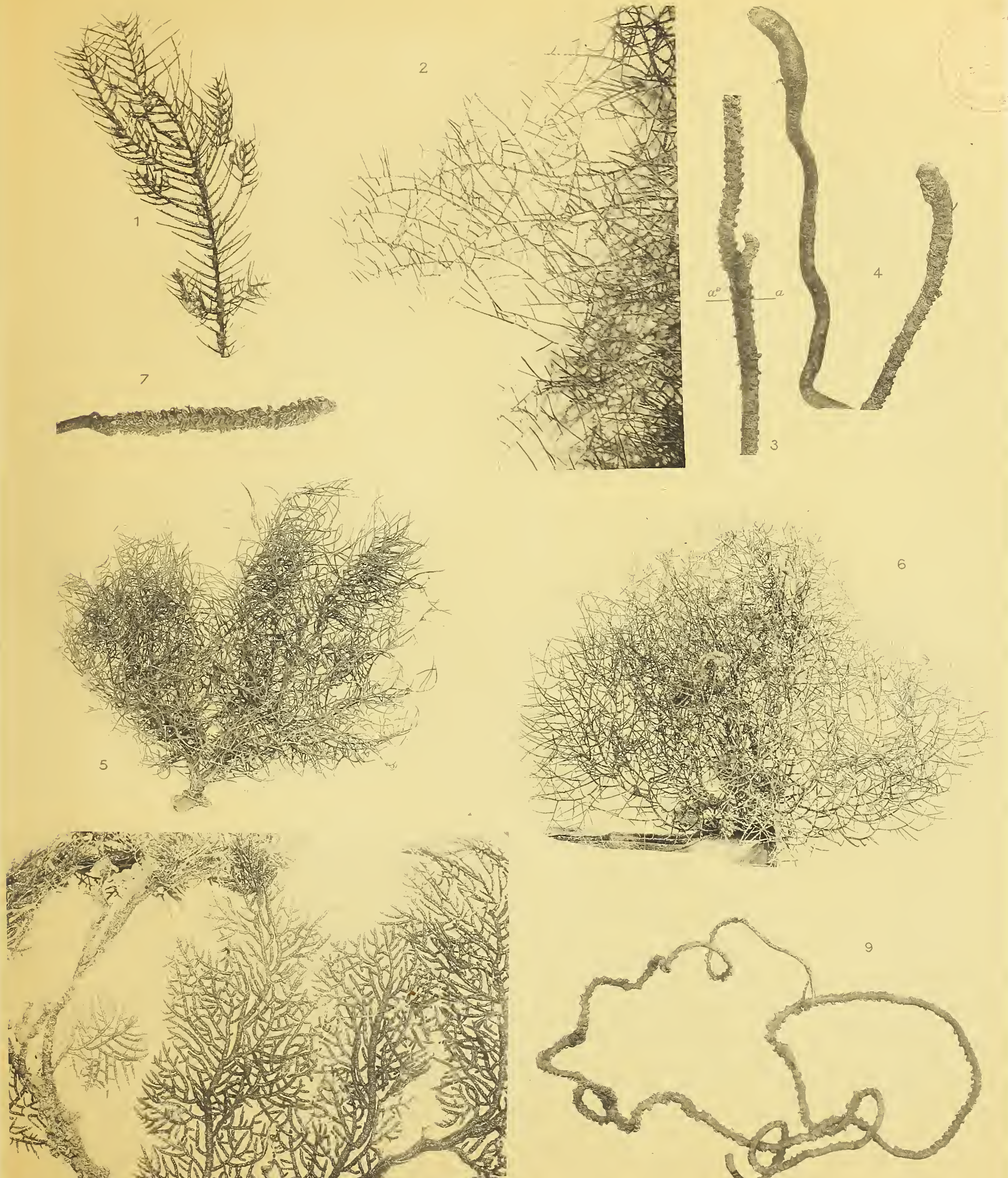
PLATE VIII.

Fig. 1. *Sibopathes gephura* g. n. sp. n. Colony.
Fig. 2. *Aphanipathes Sibogae* sp. n. Part of a colony.
Fig. 3. *Eucirripathes anguina* (Dana). Branch; its base is indicated by the line *aa*.
Fig. 4. *Eucirripathes anguina* (Dana). Colony-tops.
Fig. 5. *Euantipathes curvata* sp. n. Colony.
Fig. 6. *Euantipathes ericoides* (M. Edw.). Colony.
Fig. 7. *Eucirripathes anguina* (Dana). Part of a colony.
Fig. 8. *Aphanipathes undulata* sp. n. Part of a colony.
Fig. 9. *Eucirripathes contorta* v. Pesch. Colony.



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